6th annual meeting

Entomological Society of America

R. L. METCALF
President

HOTEL UTAH
SALT LAKE CITY, UTAH
DECEMBER 1-4, 1958

SIXTH ANNUAL MEETING

of the

ENTOMOLOGICAL SOCIETY OF AMERICA

Seventieth anniversary of the former American Association of Economic Entomologists
Fifty-third anniversary of the former Entomological Society of America

HOTEL UTAH, SALT LAKE CITY, UTAH

December 1–4, 1958

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PROGRAM OF LADIES ACTIVITIES

Monday, December 1

A.M.

10:00 — Hotel Utah Coffee Shop (Coffee and rolls furnished by E.S.A.) Get acquainted.

P.M.

2:00–4:00 — Bus tour of Richard Hudnut exhibits at the University of Utah, and Capitol Building.

5:00–6:30 — Elks Club—Entomologists Mixer.

8:00–10:00 — Photo Salon.

Tuesday, December 2

A.M.

8:00–11:00 — Shopping, visits to Makoffs, Z.C.M.I., Auerbachs, Paris, Keith O'Brians, Temple grounds, etc.

11:30–1:00 p.m. — Tabernacle Organ Recital.

P.M.

2:00–4:00 — Tour of new million dollar Associated Newspaper plant. Tour will take in all of the newspaper operations.

7:00–9:30 — Entomologists Banquet—Roof Garden, Hotel Utah.

Wednesday, December 3

A.M.

8:00–12:00 — Shopping, visiting, sight seeing tours, Tabernacle organ recital, T.V. and radio stations.

P.M.

1:00–5:00 — Bus tour to Bingham Open Pit Copper Mines, and This Is The Place Monument.

Thursday, December 4

A.M.

Open.

P.M.

2:00–3:00 — Coffee and scones, visiting, Z.C.M.I. Tea Room.

REGISTRATION

Registration Desk, Hotel Utah, Mezzanine Floor, Sunday November 30, 5:00–9:00 p.m. Monday, December 1, 8:00 a.m.–4:00 p.m. The registration desk will be open each of the remaining days of the meeting for the convenience of members and guests.

Registration Fee: Members $5.00; Student Members, $1.00; Non-Members, $7.50; Members' Wives and invitation non-member speakers, no charge.

Member's Information Desk: As has become a custom, a member's information desk will be set up near the registration desk. Mrs. Louise B. Stone, Secretary-in-charge at the Washington office, will be at this desk.

HOSPITALITY SUITES

We again request that hospitality suites be closed during scheduled sessions and at 1:00 a.m. Information regarding hospitality suites may be left at the member's information desk.

ENTOMOLOGISTS' MIXER

The mixer will be held from 5:00 to 6:00 p.m. Monday at the Elk's Club, (one block east of the Hotel Utah at 139 East South Temple Street). All members, guests, and wives are cordially invited. Admission by registration badge. The mixer is complimentary.

PHOTOGRAPHIC SALON

This is a new venture for the annual meeting. Plan to be in the Lafayette Ballroom on Monday evening. The time, 8:00 to 10:00 p.m. following the Entomologists' Mixer. The photographs, slides, and motion pictures to be shown are all pre-selected for excellence.

EXHIBITS

All registrants at the meeting will enjoy the exhibits arranged for by the *Exhibits Committee*. Those having additional exhibits should contact Dr. A. D. Hess, Encephalitis Investigations Unit, P.O. Box 625, Greeley, Colorado, as promptly as possible.

NOTICE TO EMPLOYERS

If you are considering the employment of one or more entomologists, please make inquiry at the member's information desk. We plan to have information available on members seeking employment.

SECTION AND SUB-SECTION OFFICERS

A. General Entomology

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J. A. Slater, *Vice-Chairman*
J. L. Laffoon, *Secretary*

Sub-Section b, Teaching

Philip F. Bonhag, *Chairman*
J. D. Lattin, *Vice-Chairman*
Carl A. Johansen, *Secretary*

B. Physiology and Toxicology

A. S. Perry, *Chairman*
J. M. Grayson, *Vice-Chairman*
F. W. Fisk, *Secretary*

C. Insect Biology

R. L. Rabb, *Chairman*
Ray F. Smith, *Vice-Chairman*
O. A. Hills, *Secretary*

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H. A. Jaynes, *Chairman*
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D. Medical and Veterinary Entomology

D. R. Johnson, *Chairman*
D. W. Micks, *Vice-Chairman*
Herbert Knutson, *Secretary*

E. Control, Extension and Regulatory Entomology

N. O. Berry, *Chairman*
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Sub-Section b, Plant Pest Control and Quarantine

A. P. Messenger, *Chairman*
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Kelvin Dorward, *Secretary*

F. Chemical Control Investigations

Paul A. Dahm, *Chairman*
J. B. Moore, *Vice-Chairman*
D. W. Davis, *Secretary*

Sub-Section b, Industrial and Commercial Entomology

Myron W. Smith, *Chairman Pro-tem*
R. E. Heal, *Secretary Pro-tem*

SYNOPSIS OF PROGRAM[1]

	Time	Section A	Section B	Section C			Section D	Section E	Section F
MON DEC 1	9:00–12:00 Noon	OPENING SESSION, Lafayette Ballroom (1–4)							
	1:30–1:45 p.m. Section Business	President's Room	Lafayette Ballroom	Room C-38			Junior Ballroom	Pioneer Room	Jade Room
	1:45–5:00 p.m. Papers (P) Symposiums (S)	President's Room A-b (S) Teaching (5–13)	Lafayette Ballroom (P) (14–28)	Room C-38 C-a (S) Biological Control (29–34)			Junior Ballroom (P) (35–49)	Pioneer Room (S) Insect Control (50–55)	Jade Room (P) (56–68)
	5:00–6:30 p.m.	ENTOMOLOGISTS' MIXER, Elks Club[2]							
	8:00–10:00 p.m.	INSECT PHOTOGRAPHIC SALON, Lafayette Ballroom (69–71)							
TUES DEC 2	9:00–12:00 Noon Papers (P) Symposiums (S)	President's Room (P) (72–84)		Room C-38 C-a (P) (85–97a)	Junior Ballroom C-d, Forestry (P) (98–111)		Lafayette Ballroom Resistance (S) (112–117)	Pioneer Room E-a (S) Balanced Extens. (118–125)	
	1:30–5:00 p.m. Papers (P) Symposiums (S)	Jade Room Hybridization (S) (126–131)		Little Theatre (Basement) C-b, Apiculture (S) (132–138)			Lafayette Ballroom (P) (139–153)	Pioneer Room E-a (S) (154–164)	Junior Ballroom (P) (165–179)
	4:42–5:00 p.m. Section Final Business						Lafayette Ballroom		Junior Ballroom
	7:00–9:30 p.m.	ENTOMOLOGISTS' BANQUET, Roof Garden							
WED DEC 3	9:00–12:00 Noon Papers (P) Symposiums (S)	Jade Room (P) & (S) Aggregations (180–185)	Junior Ballroom (P) (186–198)	Little Theatre C-b (P) (199–209)	President's Room C-c (P) (210–219)	Lafayette Ballroom C-d (P) (220–232)		Pioneer Room E-b Insect Control (S) & (P) (233–240)	
	11:30–12:00 Noon Section Final Business	Jade Room 11:36–12:00	Junior Ballroom	Section C—Lafayette Ballroom 11:48–12:00				Pioneer Room 11:36–12:00	
	1:30–4:30 p.m. General Session	HOWARD MEMORIAL LECTURE AND FINAL ENTOMOLOGICAL SOCIETY OF AMERICA BUSINESS, Lafayette Ballroom (241–242)							
	7:30–10:00 p.m.	OPEN TIME FOR CONFERENCES, SUPPLEMENTAL PROGRAMS, ETC.							
THUR DEC 4	9:30–12:30 p.m. Papers (P)		Jade Room (P) (243–257)	President's Room C-d (P) (258–272)			Junior Ballroom (P) (273–287)		Lafayette Ballroom (P) (288–303)

[1] Numbers in parenthesis = number of paper used in the index.

[2] 139 East South Temple Street.

DETAILED PROGRAM AND ABSTRACTS

Monday Morning, December 1

9:00–11:30 a.m.

Opening Session—Lafayette Ballroom, R. L. Metcalf, President, and P. W. Oman, President-Elect, presiding

1. Address of Welcome: The Honorable George D. Clyde, Governor, State of Utah.
2. Announcements.
3. Address by the President of the Society, "Organophosphorus Insecticides: Their Applications to Applied and Fundamental Research," R. L. Metcalf, University of California, Riverside.
4. Invitation Paper: World Wide Malaria Eradication: Progress Report. Fred L. Soper, World Health Organization, Washington, D. C.

11:30–12:00

Preliminary Business Meeting, Entomological Society of America, Lafayette Ballroom, President R. L. Metcalf, presiding.

Monday Afternoon, December 1

1:30–1:45 p.m.

Preliminary Sectional Business Meetings

Section A. General Entomology, President's Room. Chairman: J. N. Belkin.

Section B. Physiology and Toxicology, Lafayette Ballroom. Chairman: A. S. Perry.

Section C. Biology, Room C-38. Chairman: R. L. Rabb.

Section D. Medical and Veterinary Entomology, Junior Ballroom. Chairman: D. R. Johnson.

Section E. Control, Extension and Regulatory Entomology, Pioneer Room. Chairman: N. O. Berry.

Section F. Chemical Control Investigations, Jade Room. Chairman: P. A. Dahm.

1:46–5:00 p.m.

Section A. Subsection b. Teaching, President's Room

Chairman: Philip F. Bonhag
Secretary: Carl A. Johansen

1:46–2:10 p.m.

Submitted Papers:

1:46 5. The Role of the Minor in Graduate Training. John D. Lattin, Oregon State College, Corvallis.

The possibilities resulting from the substitution of an interdepartmental minor, specifically tailored to the needs of a student, for a departmental minor are considered. This system could provide better integration of minor subject matter with the major.

1:58 6. A Visual Aid for Teaching or Displays. Carl Johansen, State College of Washington, Pullman.

A demonstration of the construction of visual aids from sheet plastic, white showcard, masking tape, and suitable pictorial material. These have proven quite durable and effective in classroom and display use over a 5-year period.

2:10–5:00 p.m.

Symposium: Are Recent Graduates in Entomology Adequately Trained in Other Sciences? Moderator: Philip F. Bonhag

7. Systematics. George F. Edmunds, Jr., University of Utah, Salt Lake City.
8. Industrial Entomology. The Education of an Industrial Entomologist. Roy Hansberry, Shell Development Company, Modesto, California.
9. Toxicology. William Hoskins, University of California, Berkeley.
10. Biological Control. Are Entomologists Overtrained? Bryan P. Beirne, Department of Agriculture, Belleville, Ontario, Canada.
11. Physiology. A. G. Richards, University of Minnesota, St. Paul.
12. Ecology. Ray F. Smith, University of California, Berkeley.
13. Morphology. P. F. Bonhag. University of California, Berkeley.

1:46–5:00 p.m.

Section B. Physiology and Toxicology, Lafayette Ballroom

Chairman: A. S. Perry
Secretary: F. W. Fisk

Submitted Papers:

1:46 14. Structure and Anticholinesterase Activity of Alkylphosphonic Acid Esters. T. R. Fukuto, R. L. Metcalf, Marianne Winton and P. A. Roberts, University of California, Riverside.

The effect of the alkyl moiety in ethyl p-nitrophenyl alkylphosphonates and some sulfur containing analogs on the rate of alkaline hydrolysis and fly-brain anticholinesterase activity was examined. The anticholinesterase activity appears to be a function of both the reactivity and steric properties of the molecule.

1:58 15. Insecticidal Activity of Alkylphosphonic Acid Esters. R. L. Metcalf, T. R. Fukuto and Marianne Winton, University of California, Riverside.

Approximately 40 new alkylphosphonates were evaluated. A number were extremely toxic as contact and systemic insecticides. This series of phosphonate esters provides a much wider range of compounds with insecticidal properties than the orthophosphate esters.

2:10 16. Insecticidal Activity of Optically Active O-ethyl S-2(ethylthio)ethyl ethylphosphonothiolate. T. R. Fukuto, R. L. Metcalf and R. E. Lovins, University of California, Riverside.

The *dextro*, *levo*, and racemic forms of O-ethyl S-2(ethylthio)ethyl ethylphosphonothiolate were prepared and examined for insecticidal properties. The *levo* isomer was about ten times more toxic to certain insects than the *dextro* isomer.

2:22 17. Anticholinesterases and Spontaneous Nervous Activity. James Sternburg and C. W. Kearns, University of Illinois, Urbana.

Cockroach nerve cords blocked by 10^{-3}M TEPP return to apparently normal spontaneous activity when washed with fresh 10^{-3}M TEPP. No detectable cholinesterase activity remains. After recovery following a blocking concentration of TEPP, physostigmine, or DDT-induced toxin, cords will not block again in the same concentration of any of these materials.

[1] Numbers in parenthesis = number of paper used in the index.
[2] 139 East South Temple Street.

2:34 18. Effects of Parathion and Malathion Separately and in Combination upon Rat Esterases. F. W. Seume, J. E. Casida and R. D. O'Brien, University of Wisconsin, Madison.

Short term depression and recovery processes in various esterases of the rat were investigated. Malathion and parathion affected them in qualitatively similar ways. Combinations of both compounds in subacute and acute doses resulted in intermediate or antagonistic effects; discrepancies between degrees of symptoms and esterase inhibition were observed.

2:46 19. Comparative Cholinesterase Depressions Following the Use of Systemic Insecticides in Cattle. William M. Rogoff, South Dakota State College, Brookings.

Bovine R.B.C. cholinesterase activity following administration of American Cyanamid CL 12,880 (bolus or I.M.—15 mg./kg.) was markedly depressed. No depression followed 0.75% Dowco 109 sprays nor free-choice consumption (66 days) of Dow ET-57 (2 mg./kg./day) in salt-mix; similar ingestion of 8 mg./kg./day resulted in marked depression.

2:58 20. The Metabolism of Thimet, an Organophosphorus Insecticide, in Three Insect Species. J. J. Menn, Stauffer Chemical Company, Mountain View, California, and W. M. Hoskins, University of California, Berkeley.

The principal pathway of metabolism of Thimet to toxic metabolites in three insect species, the German cockroach, the milkweed bug, and *Rhodnius* bug, appears to be the oxidation of the mercapto sulfur of the ethylmercapto methyl moiety to the sulfoxide and/or sulfone derivative of Thimet.

3:10 21. Further Studies on the Metabolism of O,O-diethyl S-ethylthiomethyl phosphorodithioate (Thimet) by Plants, Insects and Mammals. J. S. Bowman, Hazleton Laboratories, Falls Church, Virginia, and J. E. Casida, University of Wisconsin, Madison.

The metabolism of Thimet by plants, insects and mammals was studied with chromatographic and radiotracer techniques. The proportions of Thimet, oxidized derivatives, and hydrolysis products were determined with bean plants treated systemically with Thimet, armyworms which had fed on these plants, and with the feces of the armyworms.

3:22 Recess

3:34 22. Metabolism of Malathion by Several Species of Insects. H. R. Krueger and R. D. O'Brien, University of Wisconsin, Madison.

Phosphorus-32-labeled malathion of very high specific activity was topically applied to several species of insects, and the water soluble metabolites extracted and identified by means of ion-exchange chromatography. Considerable variation in metabolism was noted with as many as 9 or more water soluble degradation products found.

3:46 23. The Metabolism and Residues of the Systemic Insecticide Dimethoate in Plants. W. D. Dauterman, G. B. Viado, J. E. Casida, and R. D. O'Brien, University of Wisconsin, Madison.

The metabolism and residues of P^{32}-labeled Dimethoate (O,O-dimethyl S-(N-methylcarbamoylmethyl) phosphorodithioate) were studied in cotton, corn and potatoes. The nature of the metabolic products were also investigated in a number of other plant species.

3:58 24. Endogenous Cholinesterase-Inhibitory Substances in the Plant Family Solanaceae. W. H. Orgell, K. A. Vaidya, E. W. Hamilton, and P. A. Dahm, Iowa State College, Ames.

Substances which strongly inhibit human plasma cholinesterase *in vitro* have been found in aqueous extracts of tissues of potato, egg plant, tomato and other solanaceous plants. Properties of the inhibitory substances and their relation to insecticide residue assay and natural plant resistance to certain insects will be discussed.

4:10 25. Phosphatase Activity in the Stable Fly, *Stomoxys calcitrans*. Shahid H. Ashrafi and Frank W. Fisk, Ohio State University, Columbus.

Inorganic phosphatase activity was studied in detail in the stable fly to establish optimal conditions. The effects of varying enzyme and substrate concentrations, pH, time of incubation, temperature, and the addition of different activating ions were measured and analyzed to determine their influence on the rate of phosphatase activity.

4:22 26. Studies with Organophosphates and Reactivators on Depression and Recovery of Fly Brain Cholinesterase. D. C. Mengle and R. D. O'Brien, University of Wisconsin, Madison.

Inhibition of cholinesterase *in vivo* by organophosphates has been studied using substrate protection, which prevents artifacts arising during homogenization. Results are compared with orthodox methods. Data also is presented indicating the *in vivo* and *in vitro* effects of the reactivators 2-PAM and 2-PAD upon the toxicity and anti-enzyme activity of several organophosphorus compounds.

4:34 27. Metabolism of C^{14}-Labeled Systox in the German Cockroach, *Blattela germanica L.* M. E. Eldefrawi and H. T. Gordon, University of California, Berkeley.

C^{14}-Systox and phosphate analog were synthesized from 2-ethylmercaptoethanol-1,2-C^{14}, through ethyl mercaptan and 2-bromoethanol-1,2-C^{14}. Isomerization of systox gave isosystox. Sulfoxides and sulfones of the ethylmercaptoethanol and sulfoxides of the insecticides were prepared by peroxide oxidation and characterized by paper chromatography. Systox in the cockroach is converted to sulfoxide and polar compounds.

4:46 28. The Penetration of Ion-impermeable Barriers in the Cockroach by an Ionizable Organophosphate. R. D. O'Brien, University of Wisconsin, Madison.

The effect of pH upon esterase inhibition by Tetram has been studied in two cockroach preparations: (a) aromatic esterase in the perfused insect, (b) cholinesterase in excised as compared with *in situ* nerve cords. The results are interpreted in terms of barriers which may protect the esterases from the ionized but not the unionized inhibitor.

1:46–4:30 p.m.

Section C. Subsection a, Biological Control, Room C-38

Chairman: H. A. Jaynes
Secretary: C. B. Huffaker

Symposium: The Future Outlook in Biological Control. Moderator: Carl B. Huffaker

29. Foreign Introductions—Has the Cream Been Skimmed? F. J. Simmonds, Commonwealth Institute of Biological Control, Ottawa, Ontario, Canada.

30. Utilization and Encouragement of Native Parasites and Predators. A. D. Pickett, Canadian Department of Agriculture, Kentville, Nova Scotia.
31. Utilization of Insect Diseases. Y. Tanada, University of California, Berkeley.
32. Natural and Chemical Control Integrated. R. F. Smith and K. S. Hagen, University of California, Berkeley.
33. Greater Use of Biological Control—General Obstacles, How to Meet Them, New Approaches. P. DeBach and R. van den Bosch, University of California, Riverside.
34. Questions and Discussion from the Floor

1:46–5:00 p.m.

Section D. Medical and Veterinary Entomology, Junior Ballroom

Chairman: D. R. Johnson
Secretary: Herbert Knutson

Invitation Paper:

1:46 35. Highlights in Medical and Veterinary Entomology During 1958. Arthur W. Lindquist, ARS, U.S.D.A., Beltsville, Maryland.

Submitted Papers:

2:02 36. The Reproductive Response of the Spiny Rat Mite, *Echinolaelaps echidninus*, to Various Blood Diets. Charles W. Philpott and R. W. Strandtmann, Texas Technological College, Lubbock.

Groups of 20 female mites were fed various bloods and blood fractions for 10-day periods. Reproductive response was best for whole rat blood, followed by chicken corpuscles, rat serum, rat corpuscles, human serum, whole human blood, frog corpuscles, human corpuscles, sheep corpuscles. Only the first four diets gave significant results.

2:14 37. Mite Transmission of a *Haemogregarine* Disease in Captive Snakes. Joseph H. Camin and Paul R. Ehrlich, University of Kansas, Lawrence, and Robert W. Hull, Northwestern University, Evanston, Illinois.

Haemogregarina serpentium, a common blood protozoan of snakes, has been experimentally transmitted by means of the snake mite, *Ophionyssus natricis*. The mode of transmission, sporogony in the mite vector, schizogony in the lung of the snake host, and gametogenesis in the snake's erythrocytes will be discussed.

2:26 38. Observations on the Rabbit Tick and Tularemia in Central and Northern Alaska. Cluff E. Hopla, University of Oklahoma, Norman.

A study involving the epidemiology of tularemia in Alaska was undertaken in cooperation with the Arctic Aeromedical Laboratory, USAF. *Haemaphysalis leporispalustris* was found to be more widely dispersed than previous publications indicated. Observations on the biology and the recovery of tularemia organisms from this tick are also reported.

2:38 39. Species and Seasonal Abundance of Ticks on Dogs in Southwestern Georgia. T. W. Haines, National Cancer Institute, U.S.P.H.S., Bethesda, Maryland, and R. D. Price, University of Minnesota, St. Paul.

Collections of 1581 ticks by season from 766 dogs in a 250 square mile area in southwestern Georgia showed that the Gulf Coast tick, *Ixodes scapularis*, outnumbered all other species combined during the fall and winter months. A wide range in temperature during the winter-spring months appeared more favorable for tick activity.

2:50 40. Experimental Tick Paralysis in Animals. Cornelius B. Philip, Rocky Mountain Laboratory, Hamilton, Montana.

Hamsters are the animals of choice for study of tick paralysis caused by bites of adult female, wild-caught and reared *Dermacentor andersoni*. Pictures show the disease also in native rodents, particularly the marmot, in a monkey, dogs and guinea pigs. Some recovered animals will again become paralyzed when re-exposed. MOTION PICTURE.

3:02 41. A Preliminary Study of Microenvironmental Factors Affecting Flea Vectors of Plague. Harold E. Stark, Communicable Disease Center, Bureau of State Services, San Francisco, California.

During 1957 a study of *Microtus californicus* and their nests revealed that seasonal fluctuations of flea species (e.g., *Hystrichopsylla linsdalei*) on hosts and in nests were dissimilar. Relative abundance of the various species were affected by moisture. Seasonal fluctuations of sylvatic plague are partly explained by these microenvironmental factors.

3:14 42. Flea Bite Allergy in Guinea Pigs. B. W. Hudson and B. F. Feingold, Kaiser Foundation Hospital, San Francisco, California.

Guinea pigs can be sensitized to the bites of fleas by exposure to flea bites. Skin reactions of sensitized animals have the typical morphology and chronology of tuberculin type reactions. Sensitization is characterized by an induction period of 5–7 days and a high degree of cross-reactivity between flea species.

3:26 Recess

3:36 43. Flea Bite Allergy in Humans—Clinical and Experimental Observations. B. F. Feingold and B. W. Hudson, Kaiser Foundation Hospital, San Francisco, California.

The clinical manifestations of flea bites are an evanescent whealing reaction and/or a prolonged tuberculin type delayed reaction. Antigenic extracts superior to flea extracts described in the literature can be prepared from fleas. These extracts duplicate the immediate whealing and delayed tuberculin type reactions caused by flea bites.

3:48 44. Preliminary Studies on Vapor Treatments for Aircraft Disinsection. Darrell R. Maddock and Herbert F. Schoof, Communicable Disease Center, Bureau of State Services, U.S.H.E.W., Savannah, Georgia.

DDVP vapors produced by nonheated vaporizers at concentrations of 0.15 micrograms/liter of air gave more than 95% kill of house flies with 30-minute exposures in simulated aircraft passenger compartments. High rate vaporization of DDVP for 30–45 minutes produced residues on plastic coated aircraft interior fabrics effective for 24–48 hours.

4:00 45. Intensive Limited Area Control of Arthropod Disease Vectors. Lafe R. Edmunds, Engineer Research & Development Laboratories, Fort Belvoir, Virginia, and Major Theodore E. Blakeslee, U. S. Army Environmental Health Laboratory, Army Chemical Center, Maryland.

Arthropod populations were sampled in test control areas, 100,000 house flies were released. Populations were reduced by daily insecticide application. Mites and general insects were reduced to low levels. Mosquito light trap and biting counts showed substantial reductions. The introduced house flies were harder to control than the natural insect populations.

B & Z Library

4:12 46. Insecticide Resistance in the Salt-Marsh Sand Fly, *Culicoides furens*. Carroll N. Smith, A. N. Davis, Donald E. Weidhaas and E. L. Seabrook, ARS, U.S.D.A., Orlando, Florida.

Larvae of *Culicodies furens* from a Florida marsh which has been treated with dieldrin, malathion and heptachlor showed more than 100-fold resistance to dieldrin, heptachlor, chlordane and lindane, about 10-fold resistance to endrin, and no resistance to DDT, malathion, parathion and Bayer 21/199.

4:24 47. Biological Evaluation of Insecticide-Treated Cords for House Fly Control at Phoenix, Arizona. Darrell R. Maddock and Paul P. Maier, Communicable Disease Centers, U.S.H.E.W., Savannah, Georgia, and Phoenix, Arizona.

House flies readily rested on cords at daily temperatures above 50° F. but preferred sunny or protected localities at lower temperatures. In time studies, half the flies on cords at given times left within 38 minutes. Treatment with 25% Diazinon was "effective" 25–50 days. Counts at sunset furnish an effective index.

4:36 48. The Effectiveness of Dow ET-57 as a Cord Impregnant for House Fly Control. John W. Kilpatrick and H. F. Schoof, Communicable Disease Center, U.S.H.E.W., Savannah, Georgia.

Cotton cords ½" diameter impregnated with 25% Dow Et-57 in xylene yielded 8 or more weeks of satisfactory house fly control in seven of eight dairy barns. Dow ET-57 is the first organophosphorus compound of relatively low mammalian toxicity which has been effective as a cord impregnant.

4:48 49. *Hermetia illucens* (Linn.) as a Factor in the Natural Control of *Musca domestica* Linn. Deane P. Furman, University of California, Berkeley.

Results of laboratory and field tests have demonstrated that essentially complete control of house fly breeding in poultry manure can be produced by *Hermetia illucens* (Linn.). Warm weather and moist manure, conditions normally favoring an explosive breeding rate of house flies, are those under which beneficial effects of stratiomyids are best displayed.

1:46–4:00 p.m.

Section E. Control, Extension and Regulatory Entomology, Pioneer Room

Chairman: N. O. Berry
Secretary: R. W. Sherman

Symposium: Successful Insect Eradication and Control.
Moderator: N. O. Berry

50. Successes in Safeguarding the United States against Plant Pests. Eugene P. Reagan, Director, Plant Quarantine Division, U.S.D.A., Washington, D. C.

51. Requirements for Successfully Eradicating an Introduced Plant Pest. Emory D. Burgess, Director, Plant Pest Control Division, U.S.D.A., Washington, D. C.

52. The Extension Service's Contributions to Insect Eradication and Control Programs. James E. Crosby, Jr., Director, Division of Agricultural Programs, Federal Extension Service, Washington, D. C.

53. Successful Insect Eradication Programs in California. R. W. Harper, Chief, Bureau of Entomology, California Department of Agriculture, Sacramento.

54. Khapra Beetle Eradication and Mexican Fruit Fly Control Activities in Northwestern Mexico. W. P. Patton, In Charge of Western Mexico Region for Cooperative Programs, Plant Pest Control Division, U.S.D.A., Tijuana, Baja California, Mexico.

55. The Cooperative Grasshopper Control Program. D. E. Gates, Extension Entomologist, Kansas State College, Manhattan.

1:46–4:54 p.m.

Section F. Chemical Control Investigations, Jade Room

Chairman: P. A. Dahm
Secretary: Donald W. Davis

Submitted Papers:

1:46 56. An Approach to Complete Integration of Chemical and Biological Control of Insects Attacking Alfalfa in Southern California. Vernon M. Stern and Robert van den Bosch, University of California, Riverside.

Progressing from the integration of chemical and biological control of the spotted alfalfa aphid, research is being conducted to bring the entire insect pest complex on alfalfa under an integrated pest control program. Selective dosages of Systox, Dylox and heptachlor comprise the principal complex of chemicals involved in this program.

1:58 57. Modes of Action of Silica Aerogels. Walter Ebeling, University of California, Los Angeles.

Silica aerogels have been investigated both with and without coatings of inorganic compounds originally added for industrial purposes. Despite their low mammalian toxicity, the coated materials have proved to be greatly superior in insecticidal effectiveness.

2:10 58. Non-Toxic, Amorphous, Silica Dioxide Compounds for the Control of German, American, Brown-Banded and Oriental Cockroaches. I. Barry Tarshis, University of California, Los Angeles.

Non-toxic, amorphous, silica dioxide compounds were found to be outstandingly effective against German, brown-banded, American and Oriental cockroaches. Two compounds, SG 67 and SG 77, applied as dusts in various establishments completely controlled German, Oriental and brown-banded roaches in from 10 days to 3 weeks.

2:22 59. Laboratory Studies of SD 4402 (an Octachlorophthalan) as an Insecticide. R. A. Corey, C. A. Horne, Jr., E. R. Johnson, H. G. Simkover and Y. P. Sun, Shell Development Company, Modesto, California.

SD 4402, a chlorinated adduct of hexachlorocyclopentadiene and 2,5-dkhydrofuran, is an outstanding new pesticide. It is toxic to a wide range of insects, being particularly effective against lepidopterous larvae. Its effectiveness, residual activity, mammalian toxicity and phytotoxicity will be discussed.

2:34 60. 1958 Field Tests of Sevin, 1-naphthyl N-methylcarbamate. E. R. Marshall and R. C. Back, Union Carbide Chemicals Company, Clayton, North Carolina, and 30 E. 42nd St., New York.

Sevin is briefly described. Results of field tests conducted at the Union Carbide Chemicals Company Research Farm are given. Various formulations of Sevin are shown to be effective for control of various insect pests attacking cotton, corn and other crops in North Carolina.

2:46 61. A Procedure for Field Testing of Baits and Chemical Attractants Against *Hippelates* Eye Gnats. Mir S. Mulla, Robert W. Dorner and George P. Georghiou, University of California, Riverside.

A simple small trap for screening attractant materials against eye gnats under field conditions has been developed. The design of the trap is based on a knowledge of the geotropic, phototropic response and attraction behavior of *H. collusor* (Tsnd.). It has many advantages over traps currently in use for population measurements.

2:58 62. The Response of Insects to Fumigants at Reduced Pressures. H. A. U. Monro, Science Service Laboratory, London, Ontario, Canada.

Response of insects in vacuum fumigation is complex. With certain stages of several insect species, increase in mortality is not directly related to decrease in pressure. In a range of reduced pressures below 100 mm. Hg. at which all visible activity is lost, insects may be more resistant than at atmospheric pressure.

3:10 Recess

Invitation Paper:

3:22 63. The Role of the Pest Control Operator in the Entomological Society of America. Ralph E. Heal, National Pest Control Association, Elizabeth, New Jersey.

Submitted Papers:

3:54 64. Toxicity of an 80-20 Formulation of Carbon Tetrachloride-Methylallyl Chloride to Adult Rice Weevils, *Sitophilus oryzae* (L.), in Wheat. John R. Pedersen and Donald A. Wilbur, Kansas State College, Manhattan.

Rice weevils were fumigated 48 hours in 11.0, 12.5 and 14.0 prcent moisture wheat. A direct relationship occurred between dosage and percentage moisture. "Knock-down" with subsequent recovery was not apparent. LC_{50} and LC_{95} values for carbon tetrachloride-methylallyl chloride (80-20 by vol.) were compared with carbon tetrachloride-carbon disulfide (80-20 by vol.).

4:06 65. A Laboratory Study of the Toxicity of 80:20 (CCl_4: CS_2 by Vol.) to Different Species and Stages of Stored-Product Insects with Special Emphasis toward the Reproducibility of Results. W. Keith Whitney, Agricultural Marketing Service, U.S.D.A., Phillip K. Harein and D. A. Wilbur, Kansas State College, Manhattan.

LC-values based on the descending order of resistance were rice weevil pupae, eggs, larvae, saw-toothed grain beetle, confused flour beetle and rice weevil adults. Results varied for parallel experiments on different days but replicates from a single day were consistent. Variations were greater with adults than immatures.

4:18 66. Laboratory Studies on the Toxicity of 80:20 (CCl_4: CS_2 by Vol.) to Certain Species and Stages of Stored-Product Insects at Exposures of 8, 24 and 48 Hours. Phillip K. Harein and D. A. Wilbur, Kansas State College, and W. Keith Whitney, Agricultural Marketing Service, U.S.D.A., Manhattan.

The order of resistance of saw-toothed grain beetle, confused flour beetle and rice weevil adults and immature rice weevils exposed to the 80:20 mixture for 8, 24 and 48 hours depended on the exposure period. LC_{50} values with confidence limits were calculated.

4:30 67. Chloroform as a Component of Fumigant Formulations. C. C. Roan, A. E. O'Donnell and Lallan Rai, Kansas State College, Manhattan.

4:42 68. Malathion Treatment Against Stored Grain Insects. D. W. Walker, Washington State College, Pullman.

Complete mortality was obtained using 4.0 ppm against the red flour beetle, saw-toothed grain beetle, flat grain beetle (*Cryptolestes ferrigineus*), granary weevil, and lesser grain borer. Germination of wheat was not affected, and no off-flavor or odor was noted when fresh, premium grade malathion was used.

5:00–6:30 p.m.

Entomologists' Mixer, Elk's Club

Monday Evening, December 1

8:00–10:00 p.m.

Insect Photographic Salon, Lafayette Ballroom

Committee: L. R. Brown, University of California, Los Angeles.
J. C. Chamberlin, ARS, U.S.D.A., Forest Grove, Oregon.
W. P. Nye, ARS, U.S.D.A., Logan, Utah.

This evening program will consist of the projection and exhibition, with appropriate commentary, of all accepted and prize-winning photographic prints, transparencies and motion pictures of insects, spiders and related arthropods. All are invited to this usually interesting and inspiring program.

69. Prints—J. C. Chamberlin, Presiding
70. Transparencies—L. R. Brown, Presiding
71. Motion Pictures—W. P. Nye, Presiding

Tuesday Morning, December 2

9:00–11:48 a.m.

Section A. General Entomology, President's Room

Chairman: J. N. Belkin
Secretary: J. L. Laffoon

Submitted Papers:

9:00 72. Hybridization and the Taxonomic Problem in Some Common Spider Mites. H. Bruce Boudreaux, Louisiana State University, Baton Rouge.

Stocks from various parts of the world of *Tetranychus telarius* (L.) and of *T. cinnabarinus* (Bois.) hybridize with each other with varying degrees of success. A method of estimating relationships is presented. It is apparent that world wide movement of spider mites occurs through commerce, complicating the taxonomic problem.

9:12 73. Considerations of Phylogeny in the Acarina. Tyler A. Woolley, Colorado State University, Fort Collins.

A brief review of phylogenetic relationships within the Acarina with particular reference to the Sarcoptiformes, and a detailed account of phylogeny within the Supercohort Oribatei. The latter group is arranged into two principal groups, the Ptyctima with a single superfamily and the Aptyctima comprising two subcohorts and nine superfamilies.

9:24 74. Problems in the Classification of Major Groups. Paul R. Ehrlich, University of Kansas, Lawrence.

Whether static or phyletic relations are preferable as a basis of classification is considered, as well as the principle of "equivalence," the function of group size in classification, and other problems of higher systematics. Examples are taken from the taxonomy of various insect groups and also from the vertebrates.

9:36 75. The Systematic Relationships of the Mayfly Families, Caenidae and Tricorythidae. George F. Edmunds, Jr., University of Utah, Salt Lake City.

The mayflies of the families Tricorythidae and Caenidae have traditionally, but erroneously, been included in a single family. By means of illustrations, morphological evidence will be presented to show that the Tricorythidae are extremely closely related to the family Ephemerellidae, and that the Caenidae are related to the family Neoephemeridae.

9:48 76. Geographic, Age and Color Variation in Some Western Species of the Mayfly Genus *Ephemerella*. Richard K. Allen, University of Utah, Salt Lake City.

By studying large series of specimens of western species of *Ephemerella* from many localities, it is evident that many authors have not realized the degree of geographic, age or color variation within a species. Examples are given of each type of variation; color variations may be either continuous or dimorphic.

10:00 77. Differentiation of Nymphs of the Genus *Melanoplus* (Acrididae) in Franklin County, Ohio, and the Vicinity. Jay A. Buxton, Texas College of Arts and Industries, Kingsville.

Nymphs of ten species of *Melanoplus*, from Franklin County, Ohio, and vicinity are described and compared. Instars of most species can be distinguished with knowledge of a combination of factors, such as biology, ecology, distribution, morphology, and color markings. Later instars are usually easier to identify than first and second.

10:12 78. *Triatoma protracta* (Hemiptera: Reduviidae), a Polytypic Species of North America. Raymond E. Ryckman, College of Medical Evangelists, Loma Linda, California.

The several populations composing this polytypic species are to be presented by the use of colored slides. The F-1 progeny from several crossings will also be shown.

10:24 Recess

10:36 79. Ecology and Systematics of the *Triatoma protracta* Complex. Raymond E. Ryckman, College of Medical Evangelists, Loma Linda, California.

This discussion will be concerned with the ecology, distribution and systematics of the *Triatoma protracta* complex in fifteen states in the United States and northern Mexico.

10:48 80. Distributional Studies of Introduced Species of Miridae (Heteroptera) Associated with Grasses in the Pacific Northwest. John D. Lattin, Oregon State College, Corvallis.

Representatives of *Leptopterna* (*Miris*), *Megaloceraea*, *Stenodema*, *Trigonotylus*, *Stenotus* and *Plagiognathus* were found associated with grasses in the Northwest. Distributional patterns seem to indicate recent introduction in several cases through the main ports of entry. Other introduced species of insects show similar patterns for the region.

11:00 81. The Francis Walker Types of Fruit Flies (Tephritidae-Diptera) in the British Museum Collection. D. Elmo Hardy, University of Hawaii, Honolulu.

A study of the Walker types has clarified much of the confusion which has existed regarding many of his species. Walker's "fruit flies" were found to properly belong in six families; 49 new generic combinations have been made; 32 new synonyms and 2 new homonyms were discovered and 3 new genera have been described from Walker species.

11:12 82. A Progress Report on the Diptera of Hawaii Study. D. Elmo Hardy, University of Hawaii, Honolulu.

Much of the background work on the Hawaiian Diptera has been completed and the Order is being treated in four volumes of the "Insects of Hawaii" series. The first volume, covering the Nematocera and Brachycera up to Dolichopodidae is now in press and the other three volumes should appear within the next few years.

11:24 83. A Preliminary Classification of the Nearctic Genera of Black Flies (Diptera: Simuliidae). Alan Stone, U. S. National Museum, USDA, Washington, D. C.

The monumental work on the Simuliidae of the USSR by Rubtzov (1956) recognizes 17 genera. The present paper evaluates these genera in relation to the Nearctic fauna and attempts to arrive at a satisfactory classification for the Nearctic species.

11:36 84. *Aedes hexodontus* Dynar and *Aedes punctor* (Kirby) in the Western United States: Notes on Distribution, Biology and Recognition Characters—(Diptera: Culicidae). Lewis T. Nielsen, University of Utah, Salt Lake City.

Difficulty in distinguishing these two closely related mosquito species has resulted in confusion concerning distribution and biology and has raised doubt as to the validity of both species. This study reports on their distribution in the western United States and presents data on taxonomic, ecological and behavioristic differences.

9:00–12:00 a.m.

Section C. Subsection a, Biological Control, Room C-38

Chairman: H. A. Jaynes
Secretary: C. B. Huffaker

Submitted Papers:

9:00 85. Progress in Biological Control of Olive Scale in California. C. B. Huffaker and C. E. Kennett, University of California, Albany.

The persian wasp gives good control of olive parlatoria in some groves, fair control in some and hardly any control in others. The effectiveness is related to survival of the parasites through the hot, dry summer, together with factors which account for re-bound of the host population.

9:12 86. Notes on the Biology and Ecology of Several Arthropod Predators Associated with Citrus and Hedgerows. H. A. Thomas, Texas A & I College, Weslaco.

Leptothrips mali increases on huisache in hedgerows without spreading to citrus. *Chrysopa* and *Stethorus* were rarely encountered. The coccinellid, *C. cacti*, was confined almost exclusively to citrus, increasing more rapidly during the latter part of summer. Predaceous Trombidiid mites, *Allothrombium* sp., built up on huisache in hedgerows and was found briefly on adjoining citrus.

9:24 87. The Importance of Predators in Reducing Cotton Insect Populations with Notes on the Influence of Certain Insecticides on the Predator Population. Louis W. Sheets, ARS, USDA, and George P. Wene, University of Arizona, Tempe.

The data show that predators are of no value in controlling lygus bugs, which are the most important cotton pest in Arizona. All insecticides tested greatly reduced the predator population.

9:36 88. Recent Developments in the Biological Control of *Therioaphis maculata* (Buckton) in Southern California. R. van den Bosch, E. I. Schlinger, E. J. Dietrick, University of California, Riverside, and B. Puttler, ARS, USDA, University of California, Riverside.

Coccinellids, disease and parasites are the major aphid enemies. Coccinellids are most active from spring through mid-summer and disease during the cooler, wetter months. Parasites, which are most effective from fall through spring, are adversely affected by alfalfa mowing in summer. During summer, natural enemies are sometimes overwhelmed by winged aphid invasions.

9:48 89. The Biology, Behavior and Description of *Praon palitans* Muesebeck, an Internal Parasite of the Spotted Alfalfa Aphid, *Therioaphis maculata* (Buckton), [Hymenoptera: Braconidae, Aphidiinae]. Evert I. Schlinger and Jack C. Hall, University of California, Riverside.

Such biological features as reproductive potential, life history, cocoon formation, mating, oviposition, hosts, reaction of host to parasite, host size preference and diapause are discussed. Effect of diapause on this parasite in the field is noted. Biotic significance of four genera of hymenopterous hyperparasites (*Aphidencyrtus*, *Asaphes*, *Charips* and *Pachyneuron*) is discussed.

10:00 90. Disease Organisms for European Corn Borer Control. George T. York, ARS, USDA, Ankeny, Iowa.

Timing of applications of *Beauveria* for first brood control was important as indicated by two years' study. Commercially prepared *Bacillus thuringiensis* gave moderate control from late applications on first brood in 1958 Second brood experiments will be reported.

10:12 91. An Unidentified Entomorphthoraceous Fungus on the Seed-Corn Maggot. F. E. Strong and K. Wells, University of California, Davis, and J. W. Apple, University of Wisconsin, Madison.

In Wisconsin during 1957, several adult seed-corn maggots were observed having large, round cavities occupying a major portion of the abdomen. Histological examinations revealed that the cavity was lined with a fungus, probably belonging to the Entomophthoracae. The biological significance of this parasitic fungus is unknown.

10:24 Recess

10:36 92. A Field Evaluation of Commercially Produced *Bacillus thuringiensis* for the Control of Lepidopterous Larvae on Crucifers. Irvin M. Hall and Lloyd A. Andres, University of California, Riverside.

Commercially produced spore materials of the microbial insecticide, *Bacillus thuringiensis*, from three manufacturers were tested against lepidopterous larvae on cauliflower and cabbage. The results indicate that the cabbage looper and imported cabbageworm can be controlled with certain concentrations of these materials. Suitable dosages and methods of application are suggested.

10:48 93. Biological and Morphological Studies on the Conopid Fly Parasite of the Alkali Bee. J. Franklin Howell and Kenneth E. Frick, State College of Washington, Pullman and Prosser.

This is an important parasite of *Nomia melanderi* in south central Washington. It appears to be the "perfect" parasite, emerging later than the bee so that some bee brood is produced before parasitism ends egg production. *Zodion* larvae, previously known only from the second instar, will be illustrated and described.

11:00 94. Observations on the Biology of *Heterostylum robustum* O.S. (Diptera-Bombyliidae), A Parasite of the Alkali Bee, *Uomia melanderi* Ckll. George E. Bohart, U. S. Legume Seed Research Laboratory, Utah State University, Logan.

Heterostylum robustum O.S. is the most important insect parasite of alkali bees in Washington, Oregon, Idaho, and northern Utah. In some heavily parasitized nesting sites this fly has nearly wiped out its host population. Its host range also includes *Nomia triangulifera*, *Halictus rubicundus*, and probably other bees.

11:12 95. The Selection of Prey by *Linyphia trinagularis* (Clerck) (Araneida, Linyphiidae). A. L. Turnbull, Entomology Laboratory, Belleville, Ontario, Canada.

A periodic watch of webs of *Linyphia trinagularis* (Clerck) was maintained to investigate prey selection by this spider. The spiders tended to select familiar species, and to reject strange species. Predation, therefore, is heaviest on species when they are abundant (familiar), lightest when they are scarce (strange).

11:24 96. Partial Immunity of *Laphygma exigua* (Hübner) to the Parasite *Hyposoter exiguae* (Viereck) (Hymenoptera, Ichneumonidae). B. Puttler, ARS, USDA, University of California, Riverside, and R. van den Bosch, University of California, Riverside.

Larvae of *Laphygma exigua* encapsulate a very high percentage of the single eggs oviposited in them by *Hyposoter exiguae*. In superparasitized hosts, a large proportion of supernumerary eggs remain unaffected. This reduces the immunity of *L. exigua* to the parasite.

11:36 97. Nematode Parasites and Associates of *Dendroctonus frontalis*, *Ips avulsus* and *Ips grandicollis*. Calvin L. Massey, Rocky Mountain Forest & Range Experiment Station, Albuquerque, New Mexico.

Several hundred adult beetles, *Dendroctonus frontalis* Zimm., *Ips avulsus* (Eichh.) and *Ips grandicollis* (Eichh.) were examined for nematode parasites. Insect galleries were examined for associated nematodes. *Dendroctonus frontalis* was found to be parasitized by 1 internal parasite; *Ips avulsus* by 1; and *Ips grandicollis* by 1. Several associated nematodes were recovered from insect galleries.

11:48 97a. The Incidence of Parasitism of the Rice Leaf Miner (*Hydrellia griseola* Fallèn) in California. Albert A. Grigarick, University of California, Davis.

Thirteen species of parasites of the rice leaf miner are found in California. The incidence of the three most abundant species *Opius hydrelliae* Muesebeck, *Chorebus aquaticus* Muesebeck, and *Halticoptera* sp. are discussed in relation to the leaf miner population on native grasses and rice.

TUESDAY FORENOON

9:00–12:00 a.m.

Section C. Subsection d, Ecology and Bionomics,
Junior Ball Room

Chairman: J. T. Medler
Secretary: G. G. Gyrisco

Submitted Papers—Special Session on Forest Entomology:

9:00 98. Protection of Forest Products from Insect Attack. L. W. Orr, USDA, Southern Forest Experiment Station, New Orleans, Louisiana.

Present forecasts indicate a growing need for increased production of forest products. Development of more effective controls for termites, powder-post beetles, ambrosia beetles, and other wood destroying insects will help to prevent future shortage of timber by prolonging the service life of wood in use.

9:12 99. Forest Insect Aerial Surveys in the Central Rocky Mountains. Amel E. Landgraf, Colorado State University, Fort Collins.

Forest insect aerial surveys in the central Rockies began in 1956. Over 26 million acres of forest are surveyed annually. Two patterns of coverage are used in surveying: gridiron pattern for rolling terrain; contour pattern in high mountains. Mapping standards are designed to fit insect conditions.

9:24 100. Forest Insect Surveys in the Central Rocky Mountains. B. H. Wilford, U. S. Forest Service, Fort Collins, Colorado.

Forest insect surveys involve appraising and describing insect conditions so that the manager can plan, control and locate each described condition. Surveys are complex; numerous tree species, selective insects and ranges in topography demand variations in techniques; forest use and economics dictate intensity. Good forest management includes programming and application of surveys.

9:36 101. Spruce Budworm Aerial Survey Research in Minnesota. Donald C. Schmiege, University of Minnesota, St. Paul.

Aerial photographs, using a high-speed camera and color film, were made of defoliated balsam fir stands. Degrees of defoliation were compared with aerial observations at 500 and 1,000 feet. In addition, quantitative larval populations and twig defoliation data were collected along the flight lines in the sampled stands.

9:48 102. Frass Size as an Indicator of Spruce Budworm Larval Instars. James L. Bean, University of Minnesota, St. Paul.

Data presented in this paper show that frass widths can be used to an advantage in determining the prevalence of the different instars of the spruce budworm, *Choristoneura fumiferana* (Clem.), in the field.

10:00 103. Research on Insects Affecting Flowers, Cones and Seeds of Southern Pines. R. J. Kowal, USDA Forest Service, Asheville, North Carolina.

Southern pine seed is an extremely valuable and growing industry (1 billion seedlings in 1958). Insect infestation of flowers, seeds and cones is high. Little is known of the insects' biology and behavior. Research reveals complex relationships which may make control difficult. Forest industries are extremely anxious for research results for control.

10:12 104. Biology of the Southwestern Pine Beetle *Dendroctonus barberi* Hopk. in New Mexico. Calvin L. Massey, Rocky Mountain Forest & Range Experiment Station, Albuquerque, New Mexico.

Life history studies on the southwestern pine beetle reveal that the insect has 3 generations per year in the fringe type of the host species. Attacks by the insect are usually associated with top killing of ponderosa pine by *Ips lecontei* Sw. Several associated insects were collected during the study.

10:24 Recess

10:36 105. The Negative Binomial Distribution as Applied to the Engelmann Spruce Beetle. Fred B. Knight, Colorado State University, Fort Collins.

Spruce beetle population fluctuations in spruce tree boles at 5 feet indicates population fluctuations above that height. Frequency distributions are plotted for beetle populations at 5 feet. The negative binomial is fitted to these frequency distributions for populations. This information is useful in developing sequential sampling for measuring beetle populations.

10:48 106. Preliminary Studies with Systemic Insecticides Against the Engelmann Spruce Beetle. R. H. Nagel, Colorado State University, Fort Collins.

It is practical to control *Dendroctonus engelmanni* with ethylene dibromide. An effective systemic insecticide would be less expensive to prevent brood development, to kill newly hatched larvae in newly infested trees, and to produce toxic trap trees.

11:00 107. Tests in Preventing Bark Beetle Attack in Stored Pulpwood. H. R. Johnston, J. F. Coyne, and V. K. Smith, Jr., USDA Forest Service, Gulfport, Mississippi.

Tests were made with various insecticides, particularly chlorinated hydrocarbons, to prevent attack by bark beetles in pine pulpwood. Fog, mist, and spray applications were unsatisfactory. Water emulsion containing 2 pounds of gamma BHC per 50 gallons applied as an instantaneous dip is recommended.

11:12 108. Mortality of Ponderosa Pine in Outbreaks of Black Pine-Leaf Scale (*Nuculaspis californica* Coleman). George F. Edmunds, Jr., University of Utah, Salt Lake City.

A high percentage of Ponderosa pine in some stands has been killed by heavy infestations of Black Pine-Leaf Scale in several severe outbreaks of this scale in California, Washington and British Columbia. Colored slides will be shown from each of several outbreaks.

11:24 109. Elm Spanworm Control with DDT Spray Applied by Airplane. Charles F. Speers, USDA Forest Service, Asheville, North Carolina.

Elm spanworms, *Ennomos subsignarius*, are new forest pests in the southeast. Injury has increased from localized spots in Georgia in 1954 to over 550,000 acres in Georgia, Tennessee and North Carolina in 1958. Aerial sprays of 1 pound of DDT/gallon of kerosene/acre at three elevations gave effective control.

11:36 110. Experiments with Newer Insecticides and Aroclor Extenders for Control of the Smaller European Elm Bark Beetle. G. R. Nielsen and J. G. Matthysse, Cornell University, Ithaca, New York.

1%, 2.5%, 5% lindane plus similar concentrations of Aroclors sprayed on elms and deposits field-weathered. *Scolytus multistriatus* evaluation demonstrated increased effectiveness by Aroclor. 2.5% lindane plus 6.25% Aroclor 5460 may be optimum. Phytotoxicity data presented and comparisons to DDT, methoxychlor, dieldrin, heptachlor, diazinon, malathion, chlordane, Sevin, Thiodan, Dibrom, ML97, Ethion.

11:48 111. Biology of the Sycamore Leaf-mining Sawfly, *Profenusa platanae* Burks. Clark O. Eads, University of California, Los Angeles.

A new species of leaf-mining sawfly has been found in Southern California. Similarity in mining habits of *Profenusa platanae* Burks and *Lithocolletis felinella* (Heinrich) may have delayed its discovery. Mining activity of *P. platanae* virtually destroys the leaf and sharply curtails the aesthetic value of a shade tree.

9:00–12:00 a.m.

Section D. Medical and Veterinary Entomology, Lafayette Ballroom

Chairman: D. R. Johnson
Secretary: Herbert Knutson

Invitation Paper:

9:00 112. Natural Control of Medically Important Insects. Dale W. Jenkins, U. S. Army Biological Warfare Laboratories, Frederick, Maryland.

Symposium: Resistance to Insecticides. Moderator: A. W. A. Brown

113. Resistance in Insects of Medical and Veterinary Importance. H. F. Schoof, U. S. Public Health Service, Savannah, Georgia.

114. Biochemistry of Resistance to Chlorinated Hydrocarbons. C. W. Kearns, University of Illinois, Urbana.

115. Resistance to Organo-Phosphorus Compounds. R. B. March, University of California, Riverside.

116. Inheritance of Insecticide Resistance and Tolerance. A. W. A. Brown, University of Western Ontario, London, Ontario, Canada.

117. Changes in Biotic Potential in Response to Dieldrin. H. Knutson, Kansas State University, Manhattan.

9:00–12:00 a.m.

Section E. Subsection a, Extension, Pioneer Room

Chairman: J. N. Roney
Secretary: T. R. Robb

Symposium: Relationships of the Extension Entomologist with Research, Teaching, Industry and Public Health. Moderator: J. E. Swift, University of California, Berkeley.

Promotion of the Safe Use of Pesticides in Cooperation with the Medical Professions and Public Health

118. Extension Viewpoint—Carl Frischknecht, Utah State University, Logan.

119. Medical Viewpoint—Joseph H. Holmes, University of Colorado Medical Center, Denver.
Discussion
Cooperation with Research Workers in Test Plot Work

120. Extension Viewpoint—R. W. Every, Oregon State University, Corvallis.

121. Research Viewpoint—H. H. Schwardt, Cornell University, Ithaca, New York.
Discussion
Recess
Extension and Industry Responsibilities to Each Other in Cooperative Work

122. Extension Viewpoint—J. N. Roney, University of Arizona, Phoenix.

123. Industry Viewpoint—Al Flebut, Niagara Chemical Division, Richmond, California.
Discussion

124. Publications. Lee Merrill, Rutgers State University, New Brunswick, New Jersey.

125. Correspondence, Office and Phone Calls. John J. Durkin, New Mexico College, State College.

Tuesday Afternoon, December 2

1:30–4:30 p.m.

Section A. General Entomology, Jade Room

Chairman: J. N. Belkin
Secretary: J. L. Laffoon

Symposium: Hybridization and its Relation to Speciation in Insects. Moderator: J. N. Belkin

126. Interspecific Hybridization in *Drosophila*. M. R. Wheeler, University of Texas, Austin.

127. Experimental Hybridization as an Approach to Certain Taxonomic Problems Involving Mosquitoes. L. E. Rozeboom, Johns Hopkins University, Baltimore, Maryland.

128. An Experiment in Insect Speciation. R. I. Sailer, ARS, USDA, Washington, D. C.

129. Ecospecies Hybridization in Lepidoptera. W. Hovanitz, California Institute of Technology, Pasadena.

130. Species of Probable Hybrid Origin in the Leafhoppers. H. H. Ross, Illinois Natural History Survey, Urbana.

131. Mosquito Species of Probable Hybrid Origin. J. N. Belkin University of California at Los Angeles.

1:30–4:30 p.m.

Section C. Subsection b, Apiculture, Little Theater Room

Chairman: W. C. Rothenbuhler
Secretary: M. D. Levin

Symposium: Methods of Testing Insecticides on Bees. Moderator: Frank E. Todd, ARS, USDA, University of Arizona, Tucson.

132. Information Required to Evaluate Bee Losses from Insecticides. J. E. Eckert, University of California, Davis.

133. Comparison of Laboratory Methods of Testing Insecticides on Bees. E. L. Atkins, Jr., University of California, Riverside.

134. Comparison of Field Methods of Testing Insecticides on Bees. S. E. McGregor, ARS, USDA, University of Arizona, Tucson.

135. Methods of Testing Insecticides on Bees in Field Cages. J. N. Weaver, Texas A. & M. College, College Station.

136. Methods of Testing Bee Attractants. A. W. Woodrow, ARS, USDA, University of Arizona, Tucson.

137. Methods of Testing Bee Repellents. G. A. Bieberdorf, Oklahoma A. & M. College, Stillwater.

138. Methods of Testing Flavor and Spray Residuals in Honey. C. A. Johansen, State College of Washington, Pullman.

1:30–4:42 p.m.

Section D. Medical and Veterinary Entomology, Lafayette Ballroom

Chairman: D. R. Johnson
Secretary: Herbert Knutson

Submitted Papers:

1:30 139. Control of House Flies, *M. domestica* L., in Poultry Laying Houses in Tropical Mexico. Douglas Barnes, Rockefeller Foundation Agricultural Program, Mexico 6, D. F.

House flies rapidly become a pest in poultry laying houses in tropical climatic conditions. Control studies using selected chemicals as larvacides in comparison with manure removal for fly control were conducted near the cities of Veracruz, Veracruz and Cuernavaca, Morelos, during 1957–58.

1:42 140. Control of the Little House Fly, *Fannia canicularis* (L.), with Dibrom on Poultry Ranches in Southern California. W. L. Gojmerac, California Spray Chemical Corporation, Whittier, California, and J. R. Waples, Orange County Health Dept., Santa Ana, Calif.

Due to frequency and amount of rain during the winter of 1957–1958, *Fannia canicularis* (L) became a problem. Manure removal was impractical, consequently control of adult populations were required. Proprietary sprays and Dibrom (o ,o-Dimethyl-0-1 ,2 , dibromo 2 ,2 dichloroethyl) phosphate were employed in a space spray program with success in reducing adult fly population.

1:54 141. Toxicity to House Fly Larvae of Insecticides Administered as Single Oral Dosages to Chicks. Martin Sherman and Ernest Ross, Hawaii Agricultural Experiment Station, Honolulu.

The acute toxicity of single oral dosages of phenothiazine, Dow ET-15, Dow ET-57, malathion, Diazinon, and Dipterex to 1-week old chicks was determined. Feces collected daily from these chicks were toxic to house fly larvae for a period of 1 to 7 days after ingestion of the insecticides.

2:06 142. Laboratory and Field Tests Against Mites and Lice Attacking Poultry. Walter S. Bigley, A. R. Roth and Gaines W. Eddy, Entomology Research Division, USDA, Corvallis, Oregon.

A method for the evaluation of candidate insecticides in the laboratory against mites and lice of poultry is described. Preliminary laboratory data and results of some field experiments are presented.

2:18 143. Insecticide Treatment of Manure for Control of House Flies with Notes on the Control of Cattle Lice and the Sheep Tick. L. Dale Haws, University of Kentucky, Lexington, and H. H. Schwardt, Cornell University, Ithaca, New York.

Diazinon was applied in calf and feeder lamb pens at 1 gal./100 sq. ft. of manure surface. At 0.063% Diazinon killed 100% of house fly eggs placed in rearing media. No cholinesterase depression was recorded in calves at this dosage rate. Diazinon at 0.25% controlled sheep ked on feeder lambs and 1% controlled lice on calves.

2:30 144. Tests with a New Organophosphorus Compound (Dowco 109) Against Cattle Grubs in Oregon. A. R. Roth and Gaines W. Eddy, Entomology Research Division, USDA, Corvallis, Oregon.

Results are presented on the systemic activity of a new Dow Chemical Company compound, 0-(4-tert.butyl-2-chlorophenyl)0 - methylmethylphosphoramidothiate (Dowco 109). The material gave very promising results when applied either as a spray or administered orally to cattle.

2:42 145. Continuous, Free-Choice Ingestion of Dow ET-57 in Salt-Mineral Mixtures for the Control of Cattle Grubs. Wm. M. Rogoff and Paul H. Kohler, South Dakota State College, Brookings.

Consumption of Dow ET-57 in salt-mix at 8 mg./kg./day (66 days) gave complete control. Consumption at 2 mg./kg./day (66 days) gave 82% control. Untreated checks and low-level treatment calves had similar weight gains and R.B.C. cholinesterase activity. Inferior gain and marked Ch B depression was noted in calves at higher treatment level.

2:54 146. Experiments with Co-ral, Dimethoate, and Trolene for Control of Cattle Grubs, with Notes on Cattle Lice. J. G. Matthysse, E. Homan, E. Bay, Cornell University, Ithaca, New York; and L. D. Haws, University of Kentucky, Lexington.

Good to excellent control *Hypoderma lineatum, bovis* by Dimethoate 15 mg/kg bolus, Trolene 110 mg/kg bolus, Co-ral 0.5% spray. Dimethoate 10 mg/kg bolus, Co-ral 0.25% spray less effective. No differences found according to month of application (Nov., Dec., Jan.). Louse control also noted. Weight gains greatest for treated, but not significant.

3:06 Recess

3:18 147. Tests with DOWCO 109 as an Animal Systemic Insecticide. R. O. Drummond and O. H. Graham, Entomology Research Division, USDA, Kerrville, Texas.

Dow Compound DOWCO 109, 0 - (4 - tertiary butyl - 2-chlorophenyl) 0 - methyl methyl phosphoramidothioate, exhibited systemic insecticidal activity against cattle grubs during 1956–7. Partial control was obtained with sprays of 0.25 and 0.5%, and intramuscular treatments of 10 and 5 mg./kg. Single oral or intramuscular treatments of 15 and 25 mg./kg. and a 1% spray were highly effective in preventing encystment of grubs.

3:30 148. Residues in the Milk of Dairy Cows Treated with Malathion Dust for Horn Fly Control. R. L. Goulding and L. C. Terriere, Oregon State College, Corvallis.

During three treatments with 4% malathion dust at intervals of nine and fourteen days, no residues in milk were detected by a colorimetric method sensitive to 0.02 ppm. Horn fly control was satisfactory. Single applications of 10% dust and 0.5% spray induced measurable residues.

3:42 149. Effectiveness of Aerosol Formulations Containing Methoxychlor and Other Insecticide-Repellents Against Biting Flies on Cattle, and Analysis of Milk from Treated Animals. Tien-Hsi Cheng, Donald E. H. Frear, and Henry F. Enos, Jr., Pennsylvania State University, University Park.

Aerosols of 1, 2, and 4% methoxychlor in formulation with N,N-diethyl-*m*-toluamide, thanite, MGK R-326 pyrethrins, and other ingredients were released on lactating cows by an automatic photo-electric device. Effectiveness of different formulations in control of biting flies and analyses of milk from treated cows will be discussed.

3:54 150. An Automatic Device for Releasing Aerosols on Beef and Dairy Cattle, and the Evaluation of Some Aerosol Formulations for Biting Fly Control. Tien-Hsi Cheng, Pennsylvania State University, University Park.

This mechanism is photoelectrically triggered and would treat 150–220 animals/filling allowing 1.5 sec./animal. Many aerosol formulations were tested. Control was excellent on horn flies and less effective on horse flies.

4:06 151. Sheep Ked Control with Phosphorus Compounds. A. R. Roth and Walter S. Bigley, Entomology Research Division, USDA, Corvallis, Oregon.

Data are presented on the control of the sheep ked with several phosphorus compounds. Some of them appeared to be definitely more effective than DDT, which was used as the standard.

4:18 152. Structure and Functional Operations of the Anal Ring in Simuliid Larvae. Maj. Gordon Field, MSC, U. S. Army Quartermaster Research & Development Center, Natick, Massachusetts.

4:30 153. Dimorphism in Simuliid Pupae. Maj. Gordon Field, MSC, U. S. Army Quartermaster Research and Development Center, Natick, Massachusetts.

4:42–5:00 p.m.

Final Business Meeting

Section D. Medical and Veterinary Entomology, Lafayette Ballroom

1:30–5:00 p.m.

Section E. Subsection a, Extension, Pioneer Room

Chairman: J. N. Roney
Secretary: T. R. Robb

Symposium: Entomology in a Balanced Extension Program. Moderator: J. B. Crosby, Director, Division of Agricultural Programs, Federal Extension Service, USDA, Washington, D. C.

154. Education vs. "Trouble Shooting." C. S. Davis, Extension Entomologist, University of California, Berkeley.

155. Working with Related Specialists. Stirling Kyd, College of Agriculture, University of Missouri, Columbia.

156. Training County Agents and Handling Local Meeting. G. F. Knowlton, Extension Entomologist, Utah State University, Logan.

157. Evaluating Extension Entomology. R. W. Lauderdale, Extension Entomologist, University of Nevada, Reno.
Discussion
Recess

Symposium: Project Organization and Operation. Moderator: J. O. Rowell, Extension Entomologist, Virginia Polytechnic Institute, Blacksburg.

158. Clean Grain. Wayne Colberg, North Dakota Agricultural College, State College Station, Fargo.

159. Crop Pest Control Program—Field, Fruit or Vegetable Crops. George Jones, Extension Entomologist, North Carolina State College, Raleigh.

160. Preparation of Pest Control Recommendations. R. W. Portman, Extension Entomologist, University of Idaho, Moscow.

161. 4-H Entomology. Andrew S. Deal, Extension Entomologist, University of California, Riverside.
Discussion

162. Visual Aid Presentation. Chairman: A. G. Bennett, Extension Entomologist, Mississippi State College, State College.

163. Visual Aids in an Extension Program. T. R. Robb, Extension Entomologist, University of Wyoming, Laramie.

164. Flip Cards, Flannel Boards, Photographic and Project Equipment. David H. Brannon, Washington State College, Pullman.

1:30–4:42 p.m.

Section F. Chemical Control Investigations. Junior Ballroom

Chairman: P. A. Dahm
Secretary: Donald W. Davis

Submitted Papers:

1:30 165. Control of the McDaniel Mite (*Tetranychus mcdanieli*) in Utah. Donald W. Davis, Utah State University, Logan, and Gerald L. Nielsen, State Department of Agriculture, State College, New Mexico.

The McDaniel mite is extremely damaging to fruit trees, especially apples, in northern Utah. Certain weeds aggravate the problem. Mites in most areas are resistant to parathion and certain other phosphates. Aramite, Kelthane, and Systox have looked good for three seasons, while Guthion and Tedion have looked excellent for two seasons.

1:42 166. Insecticidal Control of the San Jose Scale. Edward W. Anthon, Washington State College, Pullman.

Parathion has given excellent control of San Jose scale on cherries and peaches for ten years. California spray oil alone and in combination with phosphorous insecticides has given good control on sweet cherries. Insecticides have given the best control when applied during the pre-bloom period or crawler stage.

1:54 167. Four Years of Peach Spraying Experiments and Cage Tests for Plum Curculio Control. Oliver I. Snapp, ARS, USDA, Fort Valley, Georgia.

Three dieldrin applications followed by two parathion applications were the most effective of all materials tested in orchard spraying experiments. The results of feeding tests to determine the residual value and phytocidal effect on peach fruit and foliage of new insecticides offered for plum curculio control are included.

2:06 168. Studies on the Control of the Walnut Husk Fly. M. M. Barnes, J. C. Ortega, and H. R. Moffitt, University of California, Riverside.

Results will be presented from laboratory and field studies on effectiveness of organic phosphate bait sprays and full coverage sprays for control of walnut husk fly. Malathion bait sprays have provided good control but may result in outbreaks of *Tetranychus cinnabarinus* (Bois.) on some walnut varieties.

2:18 169. Efficiencies of Certain Isoparaffinic Oils Against California Red Scale and Citrus Red Mite. L. A. Riehl, University of California, Riverside.

The LD-95 values of certain synthetic monomolecular and polymolecular isoparaffinic oils were determined in the laboratory for adult female California red scale and citrus red mite eggs. Correlations were plotted of the LD-95 vs. physical-chemical property values. Curves are presented to show critical efficiency ranges.

2:30 170. Seed Treatment as a Method of Insect Control. W. H. Lange, University of California, Davis.

Application of insecticides, fungicides, growth-regulating materials, trace elements, and other entities to seeds will be summarized. Efficacy of seed treatment is dependent upon a multitude of interacting factors which for convenience are divided into insect dependent and independent to evaluate successes and failures in use of this method.

2:42 171. Translocation of Chlorinated Hydrocarbon Insecticides in Soil. J. K. Bready and J. V. Osmun, Purdue University, Lafayette, Indiana.

Movement and redeposition of technical chlorinated hydrocarbons were studied in soils in the laboratory. Determinations were made by *Drosophila* bioassay in dry and moist silt loam at 5 and 10 months; Cyclodienes translocated 7 inches in moist soil in 5 months. DDT and lindane did not translocate.

2:54 172. Breakdown of Lindane and Aldrin in Soils. E. P. Lichtenstein, University of Wisconsin, Madison.

Lindane broke down partially to a non-toxic compound within two weeks. Aldrin was converted into dieldrin more in sandy loam than muck soil. No dieldrin was formed in soils held at 7° C. At 26° C. and 46° C. peak dieldrin formation was reached 56 days after treatment followed by a decrease.

3:06 Recess

3:18 173. Persistence of Some Chlorinated Hydrocarbon Insecticides in Turf Soils. E. P. Lichtenstein, University of Wisconsin, Madison, and J. B. Polivka, Ohio Agricultural Experiment Station, Wooster.

Residue analyses of turf plots which had received single application of chlordane and B.H.C. in 1946, heptachlor in 1949 and aldrin in 1954, were made in 1958. Persistence of aldrin in soils to which insecticide had been applied as top dressing is compared to aldrin rototilled immediately after application.

3:30 174. Translocation of DDT, Lindane and Aldrin from Treated Soils into Various Crops. E. P. Lichtenstein, University of Wisconsin, Madison.

Sandy loam, Miami silt loam and muck soil were treated in 1954 with DDT, lindane and aldrin. One, two and three years after application crops were grown on these soils and edible parts were analysed. Translocation of insecticides was dependent on the chemical, individual crop and soil type.

3:42 175. Soil Drenches for Control of Narcissus Bulb Fly. Charles F. Doucette, Ornamentals *Insect Research Laboratory, USDA, Sumner, Washington.

Drench applications of heptachlor, aldrin and Bayer L-13/59 to narcissus plants have given a very high degree of protection against attack of narcissus bulb fly. One application at the beginning of the adult activity period appears sufficient.

3:54 176. The Effectiveness of Chlorinated Hydrocarbon Insecticides as Soil Treatments Against the Eye Gnat *Hippelates collusor* (Tsnd.) in the Laboratory. Mir S. Mulla, University of California, Riverside.

A procedure for screening soil insecticides against eye gnats in the laboratory has been perfected. Evaluation of some of the chlorinated hydrocarbon insecticides against *H. collusor* has indicated three (SD 4402, Endrin and DDT) to have appreciable biological activity. Data on these and others will be presented.

4:06 177. A New Testing Method to Determine the Effectiveness of Residual Insecticides Against the German Cockroach. Roger W. Meola and Dwight M. DeLong, Ohio State University, Columbus.

A new method of applying insecticides to various surfaces for residue testing is presented, which requires an electric aerosol generator. The test insects consisted of a chlordane-resistant and a chlordane-susceptible strain of German cockroaches. Data are presented on chlordane and some of the newer organic phosphate compounds.

4:18 178. Toxicity of the Piperonyl Ester of Chrysanthemumic Acid and Some of its Derivatives in Comparison with Allethrin and Pyrethrins as House Fly Sprays. W. A. Gersdorff and P. G. Piquett, USDA, Beltsville, Maryland.

Eighteen new compounds were tested on Campbell turntable against house flies, *Musca domestica* L. Most toxic were 6-bromo- and 6 chloropiperonyl esters of *dl-cis-trans* chrysanthemumic acid, the latter now known as barthrin. They were about 21 and 31% as toxic as allethrin, 51 and 83% as toxic as pyrethrins at 50% mortality level.

4:30 179. Chemical Control of Silver-Top in Oregon. G. W. Krantz, E. A. Dickason and J. R. Hardison, Oregon State College, Corvallis.

Various insecticides applied to Chewings fescue in Oregon have reduced the incidence of silver-top. Results suggest that thrips control may be responsible for silver-top reduction. However, the exact relationship between thrips and stem injury associated with silver-top has not been determined.

4:42–5:00 p.m.

Final Business Meeting

Section F. Chemical Control Investigations, Junior Ballroom

Tuesday Evening, December 2

7:00–9:30 p.m.

Entomologist's Banquet, Roof Garden

Wednesday Morning, December 3

9:00–12:00 a.m.

Section A. General Entomology, Jade Room

Chairman: J. N. Belkin
Secretary: J. L. Laffoon

9:00–11:00 a.m.

Symposium: Insect Aggregations. Moderator: W. E. LaBerge. This symposium was assembled by members of the American Section of the International Union for the Study of Social Insects.

180. Physioecological Activities of Aggregating Hippodamia. Kenneth S. Hagen, University of California, Berkeley.

181. Swarming Aggregations in Nematocerous Diptera. J. A. Downes, Division of Entomology, Department of Agriculture, Ottawa, Ontario, Canada.

182. Factors Involved in Nest Aggregation of Burrowing Bees. George E. Bohart, U. S. Legume Laboratory, Logan, Utah.

Submitted Papers:

11:00 183. A Quantitative Measure of Aggregation in Insects. William E. Waters, Northeastern Forest Experiment Station, New Haven, Connecticut.

Aggregation is both a statistical and a fundamental biological characteristic. The occurrence of insects in natural units of their habitats is best expressed in frequency series, and the parameter k of the negative bionomial distribution is a readily computed measure of aggregation. Examples from natural and artificial populations demonstrate its utility.

11:12 184. Clipperton Island—A Short History of Visits of Scientists to this Atoll. Charles F. Harbison, Natural History Museum, San Diego, California.

A running account of Clipperton's exploration by scientists will be presented. The invertebrate collections made on the island will be stressed. The collectors of these specimens will be mentioned along with date of collection and, where possible, the present location of insect specimens. Two map slides, showing general view of island, will be shown.

11:24 185. Clipperton Island Invertebrates. Charles F. Harbison, Natural History Museum, San Diego, California.

A preliminary report on the insects and other invertebrates collected on this interesting atoll during part of August of this year will be given. Topotypes and species new to science will be stressed. Illustrated with Kodachrome slides and mounted specimens.

11:36–12:00 a.m.

Final Business Meeting

Section A. General Entomology, Jade Room

9:00–12:00 a.m.

Section B. Physiology and Toxicology, Junior Ballroom

Chairman: A. S. Perry
Secretary: F. W. Fisk

Submitted Papers:

9:00 186. A New Insecticidally Active Pyrethroid. Shen Chin Chang and Clyde W. Kearns, University of Illinois, Urbana.

Partition chromatography of pyrethrum extracts shows a compound intermediate in polarity between "pyrethrin I" and "pyrethrin II". An ester with properties similar to known pyrethroids, this material shows selective absorption at 233–234 mμ and forms a crystalline semicarbazone, m.p. 153° C. (λ max.—260 mμ). It is about ¼ as toxic as pyrethrin I to house flies.

9:12 187. Metabolism of Pyrethrin I by the House Fly. Shen Chin Chang and Clyde W. Kearns, University of Illinois, Urbana.

Pyrethrin I dosages permitting 10–25% house fly survival in 18–20 hours are almost completely metabolized. Alkaline hydrolysis of fly extracts yields greater amounts of chrysanthemic acid than expected from Pyrethrin I present. Rather than ester hydrolysis being the principal route, prior modification of the alcohol portion may be the more significant process.

9:24 188. Fate of C^{14}-Diethyltoluamide Applied to Guinea Pigs. Claude H. Schmidt, Fred Acree, Jr., and Malcolm Bowman, ARS, U.S.D.A., Orlando, Florida.

The repellent absorbed by different animals ranged from 20% to 47% of the applied dose. Over 80% of the absorbed dose was excreted in the urine as water soluble metabolites in 24 hours. Very small amounts of radioactivity were found in the feces, blood, skin and hair.

9:36 189. Properties of Purified House Fly DDT-Dehydrochlorinase. H. Lipke and C. W. Kearns, University of Illinois, Urbana.

A forty-six thousand-fold purification of this enzyme has been achieved. The Michaelis and equilibrium constants and the activation energy has been determined. Other physical and chemical characteristics will be presented. An assay technique suitable for kinetic studies with water-insoluble substrates will be described.

9:48 190. Specificity of House Fly DDT-Dehydrochlorinase. H. Lipke and C. W. Kearns, University of Illinois, Urbana.

Measurements of initial rates show that TDE is dehydrochlorinated faster than DDT. No correlation is apparent between alkali lability, toxicity and enzymatic degradation of DDT analogs. The enzyme can be demonstrated in susceptible adults. The specificity of the enzyme for substrate and co-enzyme indicate a possible alternate function *in situ*.

10:00 191. DDT-Dehydrochlorinase Activity in the Mexican Bean Beetle. A. N. Chattoraj and C. W. Kearns, University of Illinois, Urbana.

DDT-dehydrochlorinase can only be demonstrated following homogenization in glutathione or thiomalate. Glutathione acts as activator as well as protector. Substitution of DPN, CoA, Cysteine, ascorbate or yeast extract yields no DDE. In addition to DDT, TDE and methoxychlor are dehydrochlorinated. Considerable activity is lost during storage of frozen larvae.

10:12 192. Enzymatic Breakdown of DDT by Susceptible and DDT-Resistant Body Lice. Albert S. Perry, Communicable Disease Center, U.S.H.E.W., Savannah, Georgia.

An enzyme, DDT-ase, extractable from susceptible and DDT-resistant body lice catalyzes the breakdown of DDT to yield a nontoxic, water-soluble, Schechter-Haller positive derivative. The enzyme is activated by glutathione, ascorbic acid, thioglycollic acid, or cysteine. It is heat-stable and has optimum activity at pH 8–10.

10:24 Recess

10:36 193. The Effect of DDT Poisoning on Free Amino Acids in the Hemolymph of the American Cockroach. John J. Corrigan and Clyde W. Kearns, University of Illinois, Urbana.

Whereas major amino acids showed insignificant changes, proline was depleted in DDT-poisoned cockroaches. As prostration time increased, proline progressively decreased. Reversal of symptoms resulted in gradual restoration of hemolymph proline levels. Pyrethrum, dieldrin and TEPP produced slight reductions, but these changes lacked the progressive character of those induced by DDT.

B & Z Library

10:48 194. Efficiency of Plant Uptake of Granulated Systemic Insecticides from Soil Applications. H. T. Reynolds and R. L. Metcalf, University of California, Riverside.

Plant uptake of granulated systemic insecticides following soil application (side dressing) appears to be influenced by water solubility. To be toxic to certain phytophagous species, the insecticide must be sufficiently water soluble to move in the soil, but probably not so high that too much compound is lost to the root zone.

11:00 195. Effects of Soil Insecticides and Absorbants on Plant Sugars and Resulting Effect on Mite Nutrition. J. G. Rodriguez, Donald E. Maynard, H. H. Chen and Walter T. Smith, Jr., University of Kentucky, Lexington.

The effects of such soil insecticides as DDT, BHC, lindane, dieldrin, aldrin and chlordane on the sugar and NPK composition of beans were studied. DDT and BHC effected the most striking changes in composition. Generally DDT increased total nitrogen and reducing sugars as well as *Tetranychus telarius* populations.

11:12 196. Residues Following Spray Application of P^{32}-Labeled Hercules AC-528 (Delnav) to a Hereford Steer. Frederick W. Plapp, Jr., Walter S. Bigley and Darrell I. Darrow, ARS, U.S.D.A., Corvallis, Oregon.

The metabolism and residues associated with a spray application of Hercules AC-528 to a beef animal were investigated using radiotracer techniques. Data are presented on tissue residues and the nature of the metabolic products.

11:24 197. Prechromatographic Purification of Insecticides from Tissue Extracts. J. J. Menn, Stauffer Chemical Company, Mountain View, California; M. E. Eldefrawi and H. T. Gordon, University of California, Berkeley.

A rapid, simple, and quantitative method was developed for removal of interfering lipoid extractives prior to paper chromatography of insecticides and their metabolites expected from insect tissues. Following purification, reproducible Rf values were obtained for several chlorinated hydrocarbon and organophosphorous insecticides and their metabolites extracted from tissues.

11:36 198. Response of the Mexican Bean Beetle, *Ephilachna varivestis* Muls., to Fungus Fermentation Products and Techniques for Isolating their Active Components. A. N. Kishaba, M. C. Wilson, D. L. Shankland and R. W. Curtis, Purdue University, Lafayette.

Products of fungus fermentation were screened for biological activity on insects. Five filtrates were active against the Mexican bean beetle; three appeared inhibitory and two toxic. Three soil fungus filtrates were studied by paper and column chromatography. Active components on paper chromatograms were located by Mexican bean beetle bioassay technique.

11:48–12:05 a.m.

Final Business Meeting

Section B. Physiology and Toxicology, Junior Ballroom

9:00–12:00 a.m.

Section C. Subsection b, Apiculture, Little Theatre

Chairman: W. C. Rothenbuhler
Secretary: M. D. Levin

Submitted Papers:

9:00 199. The Foraging of Honey Bees on Alfalfa—A Comparison of the Dispersion Patterns of Young and Normal-aged Field Bees when Moved into a New Area. M. D. Levin, U. S. Legume Seed Research Laboratory, Utah State University, Logan.

Studies undertaken in northern Utah alfalfa fields using mass-marked bees revealed that foraging field bees dispersed from their hives to about the same extent after being moved into a new area whether they were field bees of normal age or young field bees foraging for the first time.

9:12 200. Distance from the Apiary as a Factor in Alfalfa Pollination. M. D. Levin, G. E. Bohart and W. P. Nye, U. S. Legume Seed Research Laboratory, Utah State University, Logan.

Experiments are reported on the effect of progressively increasing distances from honey bee apiaries on bee populations in northern Utah alfalfa fields. It was found that the level of the bee population appeared to influence the effect of alfalfa fields.

9:24 201. Carrot Pollinators in Logan, Utah. William P. Nye and George E. Bohart, U. S. Legume Seed Research Laboratory, Utah State University, Logan.

Approximately 240 species of insects were found on carrot umbels at Logan from 1953–57. Principal orders ranked in importance as follows: Hymenoptera, Diptera, Coleoptera, Hemiptera, Lepidoptera, Thysanoptera. Diptera were commoner than Hymenoptera but commonest species were poor pollinators. Honey bees were efficient but usually less common than other efficient insects.

9:36 202. New Modification of the Pollen Trap. William P. Nye, U. S. Legume Seed Research Laboratory, Utah State University, Logan.

The Barns pollen trap was modified by moving the screen and tray to the middle of the hive to keep the pollen dry, providing a wider screen to prevent congestion by incoming and outgoing bees and by having the trap slide from the side instead of the front.

9:48 203. Genetics of Disease-Resistant Behavior in Honey Bees. Walter C. Rothenbuhler, Iowa State College, Ames.

Sixty-three colonies of honey bees involving two inbred lines, F_1's and backcrosses were tested to learn whether they would remove American foulbrood-diseased larvae and pupae from their broodnest. Results lead to formulation of the hypothesis that such removal, called hygienic behavior, is due to two non-linked recessive genes.

10:00 204. The Genetic Control of Size in Queen Honey Bees. Roger Hoopingarnar, University of Wisconsin, and C. L. Farrar, ARS, U.S.D.A., Madison, Wisconsin.

Inbred lines of honey bees (*Apis mellifera* L.) are compared with each other and with their F_1 hybrids. The criterion for comparison is the weight of the queen. Differences between inbred lines and the influence of the degree of inbreeding on size of the resulting queens are shown.

10:12 205. Oral Toxicity of Four Herbicides to Honey Bees. Paul E. Milem, Ohio State University, Columbus.

Oral toxicity to honey bees of four herbicides was determined by feeding commercial formulations in sugar syrup. Methods of handling and testing are discussed. Average LC_{50}'s: 2,4-D 6,100; 2,4,5-T 7,500; Dowpon 37,000; Amino Triazole 18,000; and a combination of 2,4-D and 2,4,5-T 10,000 μg/ml.

WEDNESDAY FORENOON

10:24 Recess

10:36 206. Field Tests on Toxicity of Pesticides to Honey Bees in California in 1958. L. D. Anderson and E. L. Atkins, Jr., University of California, Riverside.

Large scale field tests were made with different insecticide treatments on honey bees. Mortality and population studies in the alfalfa fields and at the colonies showed Sevin and parathion to be highly toxic to honey bees, DDT and Endrin moderately toxic, and toxaphene, Delnav, Ethion and Systox relatively non-toxic.

10:48 207. Studies of the Alkali Bee, *Nomia melanderi* I. Soil Texture and Soil Moisture Requirements. W. P. Stephen, Oregon State College, Corvallis.

In an attempt to increase the numbers of the alkali bee in alfalfa seed producing areas of Oregon, studies on the soil texture and soil moisture were undertaken to determine the restricting influences each of these factors played in the spread of the bee to new sites.

11:00 208. Biological Studies on the Alkali Bee. Kenneth E. Frick, Irrigation Experiment Station, Prosser, Washington.

This native pollinator of alfalfa is abundant in south central Washington. Results of studies on conditions required for nesting will be presented. Such factors as abundance and depths of nesting will be correlated with soil type, moisture content, and vegetative cover.

11:12 209. Poisoning of Honey Bees by Death Camas Blossoms. John D. Hitchcock, U. S. Bee Culture Laboratory, University of Wyoming, Laramie.

Worker honey bees fed traces of nectar centrifuged from blossoms of *Zygadenus venenosus* diluted with sugar sirup, and those fed death camas pollen in sugar sirup, all died within 24 hours, whereas their sisters of identical age fed pure sugar sirup had an average longevity of 33 days.

11:24 Discussion Period

9:00–12:00 a.m.

Section C. Subsection c, Relations of Insects to Plant Diseases, President's Room

Chairman: R. C. Dickson
Secretary: Karl Maramorosch

Submitted Papers:

9:00 210. Insects Transmit Oak Wilt via Blazes and Auger Wounds made Late in April and Early May. W. D. Buchanan, U. S. Forest Service, Columbia, Missouri.

In tree wounding studies in Missouri, oak wilt developed only in trees that were blazed or wounded with an auger between April 16 and May 6, inclusive. Nitidulids, roaches, and ants were trapped in the wounds and are considered to be the vectors, but where they got the inoculum is unknown.

9:12 211. Prevention of Bark Beetle Transmission of *Ceratiocystis ulmi* (Buis.) Moreau, with the Systemic Insecticide, 0,0'-diethyl-S-(beta diethylamino) ethyl phosphorothiolate hydrogen oxalate. Abdullah Al-Azawi and Dale M. Norris, Jr., University of Wisconsin, Madison.

Scolytus multistriatus beetles, contaminated with the fungus, *Ceratiocystis ulmi*, were caged on systemic-treated and untreated elm trees during May, June and August 1958. Only untreated trees have developed Dutch elm disease. This significant control is attributed to deposition of the systemic in twig bark throughout the tree.

9:24 212. Effectiveness of DDT Dormant Spray in the Control of *Scolytus multistriatus* (Marsh.), Vector of *Ceratiocystis ulmi* (Buis.) Moreau. Dale M. Norris, Jr., and Abdullah Al-Azawi, University of Wisconsin, Madison.

DDT as a treatment to dormant elms for control of *Scolytus multistriatus* was evaluated. Monthly branch samples from the crown of each tree were assayed against beetles for mortality and feeding data. Fall application failed to protect elms during the following spring and summer, whereas, spring application gave protection.

9:36 213. Relation of Aphids to Spread of Cucumber Mosaic Virus in Gladiolus. K. G. Swenson and R. L. Nelson, Oregon State College, Corvallis.

Alates of more than 22 aphid species occur on gladiolus but colonization rarely occurs. Most species tested were able to transmit CMV. Field spread in gladiolus is due to migrating aphids. Significance of this type of spread is discussed.

9:48 214. Aphid Transmission of the Feathery Mottle Virus of Sweet Potato. Donald L. McLean, University of California, Alisal Branch, Salinas.

The green peach aphid was used as the vector of the feathery mottle virus of sweet potato to determine the acquisition and inoculation threshold periods, the relationships of pre- and post-acquisition fasting on transmission, and the effect on efficiency related to artificial interruption of acquisition feeding. Additional aphid species were found to be vectors.

10:00 215. Factors Determining the Rate of Spread of Lettuce Mosaic. R. C. Dickson, University of California, Riverside.

The rate of spread of lettuce mosaic is determined by the number, behavior and efficiency of vector species present, and by the availability of inoculum.

10:12 216. A Plant Virus Harmful to its Leafhopper Vector. D. D. Jensen, University of California, Berkeley.

Peach yellow leaf roll virus, a virulent strain of Western X-disease virus, was found to reduce the longevity of leafhoppers which acquired the virus. After transfer to test plants, virus free *Colladonus montanus* (Van Duzee) lived approximately twice as long as did those which transmitted virus.

10:24 Recess

10:36 217. Invasion of the Southeast by a Western Leafhopper. H. N. Pollard, W. F. Turner and G. H. Kaloostian, ARS, U.S.D.A., Fort Valley, Georgia.

The initial invasion, establishment and dispersion of *Homalodisca insolita* (Walker) in the Fort Valley area is described with additional data showing its present distribution in the southeast. The relationship of the leafhopper to the phony peach disease virus is cited.

10:48 218. Lycium Blight and its Transmission by Lycium Leafhoppers and the Beet Leafhopper. Robert A. Flock, University of California, Riverside.

A new virus disease was found to be transmitted by Lycihm leafhoppers and the beet leafhopper. The virus disease is distinct from curly top and adds to the economic importance of the beet leafhopper. Work was mostly confined to the Imperial Valley, California, but the virus appears to be widespread.

11:00 219. The Discovery in Utah of the Beet Leafhopper-Curly Top Relationship. Robert A. Flock, University of California, Riverside.

In 1905 E. D. Ball, first Utah Agriculture Experiment Station Entomologist, discovered that the beet leafhopper carried curly top by feeding on the sugar beet. His effort to control the beet leafhopper was the first of many programs to control plant virus disease spread by control of an insect vector.

11:12 Discussion Period

9:00–11:48 a.m.

Section C. Subsection d, Ecology and Bionomics, Lafayette Ballroom

Chairman: J. T. Medler
Secretary: G. G. Gyrisco

Submitted Papers:

9:00 220. Distribution of Mites Important to Agriculture. Edward W. Baker, U. S. National Museum, USDA, Washington, D. C.

Although distribution of mites in most areas of the world is poorly known, present knowledge is sufficient to indicate probable areas for future infestation, both by transportation of plants by man, or through the natural distribution of economic species.

9:12 221. The "Sex Ratio" in Spider Mites. H. Bruce Boudreaux, Louisiana State University, Baton Rouge.

Multiple matings of single females may occur. The process controlling the production of fertilized eggs (female-producing) or unfertilized eggs (male-producing) is unknown. Sex ratios vary from low to high and do not seem to be dependent upon the number of matings.

9:24 222. Some Interesting Aspects of Oribatid Ecology. Tyler A. Woolley, Colorado State University, Fort Collins.

A short discussion of some known ecology of iribatid mites, including biology, "indicator" species and distributional data.

9:36 223. The Effect of Plant Nutrition on Susceptibility of the Two-Spotted Spider Mite (*Tetranychus telarius* L.) to Malathion. Thomas J. Henneberry, Neil W. Stuart and Floyd F. Smith, USDA, ARS, Beltsville, Maryland.

At Beltsville, Maryland, variations in plant growth of lima beans in quartz sand were induced by controlled nutrient "feeding." Spider mites infested on these plants and tested for level of susceptibility to malathion have been shown to be significantly affected by the plant nutritional level upon which they are maintained.

9:48 224. Biology of the Brown Wheat Mite, *Petrobia latens* (Müll.). H. C. Cox, USDA, ARS, State College, Mississippi, and F. V. Lieberman, USDA, ARS, Bakersfield, California.

Active egg incubation period and the time required for development in each growth stadium were observed in relation to temperature. Records were also taken on the number of active and diapause eggs laid by each female under observation.

10:00 225. Attraction of Fabric Pests to Stains on Wool. A. Mallis, A. C. Miller and R. C. Hill, Gulf Research and Development Company, Pittsburgh, Pennsylvania.

Tests with the larvae of the webbing clothes moth and the black and furniture carpet beetles show the newly-emerged larvae are definitely attracted to sweat, urine, and stains made by certain fruit juices. The larger larvae feed on clean wool whether or not it is stained.

10:12 226. Natural Conditions Influencing the Abundance of Lepidoptera Affecting Grasses Grown for Seed in Eastern Washington. Clifford S. Crawford and Robert F. Harwood, State College of Washington, Pullman.

An overall study of insects affecting grasses grown for seed in eastern Washington indicates subterranean larval Lepidoptera to be the major pests. Population survey methods include soil examination, field sweeps, emergence traps and light traps. Climatic factors, which are also measured, affect adult flight activity.

10:24 Recess

10:36 227. The Head Capsule Measurements of the Larvae of Small and Large Strain Rice Weevil, *Sitophilus oryzae* (L.), and Granary Weevil, *S. granarius* (L.), in Wheat. Edwin L. Soderstrom and Donald A. Wilbur, Kansas State College, Manhattan.

Ninety-nine percent of the rice and granary weevil larvae were identified to instar by measurements of head capsules. Measurements and results will be discussed.

10:48 228. Initiation and Termination of Diapause in the Boll Weevil (*Anthonomus grandis* Boh.). N. W. Earle and R. C. Gaines, ARS, USDA, and J. S. Roussel and L. D. Newsom, Louisiana State University, Baton Rouge.

Several factors in the adult environment have been shown to affect diapause. The most important are nutrition, temperature, and exposure to light. The tendency for the adult to enter diapause is largely determined during the immature stages; temperature and larval nutrition appear to be involved.

11:00 229. Evidence of Extended Diapause in the Eggs of Four High Altitude Species of Grasshoppers. Joseph B. Kreasky, ARS, USDA, Bozeman, Montana.

Eggs of four species of grasshoppers were collected in cages and permitted to remain in the soil for two seasons, after which they were removed and incubated. Hatching was complete in one species, but only partial in three others. An additional cold period induced hatching in the remaining diapause eggs.

11:12 230. Ecology of the Big-headed Grasshopper, *Aulocara elliotti*, R. E. Pfadt and D. R. Tyndall, University of Wyoming, Laramie.

A study of the population biology of *Aulocara elliotti* on virgin range land near Glendo, Wyoming, has shown that numbers of grasshoppers have been on the increase over a period of three years. The chief factors influencing population changes appeared to be weather and other organisms—parasites, predators, and disease.

11:24 231. Attractants for the Walnut Husk Fly. M. M. Barnes, University of California, Riverside.

Results will be presented from studies with attractants for detecting fly populations, indexing seasonal abundance, attracting to and feeding upon toxic deposits, and for labeling a natural population with a radiotracer for study of flight habits.

11:36 232. Biology of Some *Pleocoma* Associated with Fruit Trees in Oregon (Coleoptera: Scarabaeidae). F. E. Ellertson, Mid-Columbia Experiment Station, Hood River, Oregon.

Two species, *P. crinita* Linsley and *P. minor* Linsley, are associated with roots of apple, pear and sweet cherry trees in Hood River County, while a third species, *P. oregonensis* Leach, is associated with roots of sweet cherry trees in Wasco County.

11:48–12:00 a.m.

Final Business Meeting

Section C. Biology, Lafayette Ballroom

9:00–11:36 a.m.

Section E. Subsection b, Plant Pest Control and Quarantine Pioneer Room

Chairman: W. T. Mendenhall
Secretary: Kelvin Dorward

Symposium: Plant Pest Control and Quarantine. Moderator: Kelvin Dorward

233. Residues as Related to Control Programs. Herbert L. Haller, Assistant to Administrator, ARS, USDA, Washington, D. C.

234. The Need for Comprehensive Pest Detection Operations. Harold J. Ryan, Agricutlural Commissioner, Los Angeles County, Los Angeles, California.

235. Industries' Interests in Economic Pest Surveys. W. E. McCauley, Manager New Products Development, Shell Chemical Corporation, New York, N. Y.

236. Training a Plant Quarantine Inspector. Thomas G. Darling, Plant Quarantine Division, Plant Quarantine Training Center, New York, New York.

237. Entomology as it Relates to State Regulatory Agencies. W. T. Mendenhall, State Entomologist, Commission of Agriculture and Horticulture, Phoenix, Arizona.

Submitted Papers:

11:00 238. The Role of Attractants in the Mediterranean Fruit Fly Eradication Program in Florida. L. F. Steiner, Fruit Fly Laboratory, U.S.D.A., Honolulu, Hawaii; G. G. Rohwer, Plant Pest Control Division, U.S.D.A., Winter Haven, Florida; Ed L. Ayers, Florida State Plant Board, Bradenton, and L. D. Christenson, ARS, U.S.D.A., Beltsville, Maryland.

Traps baited with newly discovered Mediterranean fruit fly lures revealed infestations that involved 800,000 acres in 28 Florida counties in 1956 and 1957. Aerial applications of protein hydrolysate-malathion bait sprays through the span of 1 or more generations effected complete eradication by late 1957. Aggregate acres sprayed exceeded 6.8 million.

11:12 239. The Detection of Plant Pests at Quarantine. Thomas G. Darling, Plant Quarantine Division Training Center, New York.

Quarantine inspection of plant products yields information of foreign plant pests available from no other source and affords a limited survey of pest conditions in areas from which such products originate. The Plant Quarantine Inspector is trained to look for notorious plant pests and to recognize those of greater quarantine significance.

11:24 240. Would Licensing Entomologists Benefit the Profession? George F. Carter, Agricultural Pest Control Operators Association, Inc., Lafayette, California.

Together with the Agricultural Aircraft Association, the Agricultural Pest Control Operators Association may propose legislation in California to limit prescribing for pest control to licensed pest control consultants. Possibly patterned after legislation for the medical profession and with a grandfather clause, this may be a great boon to the entomologist.

11:36–12:00 a.m.

Final Business Meeting

Section E, Control, Extension and Regulatory Entomology, Pioneer Room

Wednesday Afternoon, December 4

1:30–4:30 p.m.

L. O. Howard Memorial Lecture and Final Business Meeting, Lafayette Ballroom, President R. L. Metcalf, presiding
Lecture:

1:30 241. Metamorphosis: A Tool for the Study of Growth. Carroll M. Williams, Harvard University, Cambridge, Massachusetts.

2:30 242. Business Meeting

Thursday Morning, December 4

9:00 a.m.–12:12 p.m.

Section B. Physiology and Toxicology, Jade Room

Chairman: A. S. Perry
Secretary: F. W. Fisk

Submitted Papers:

9:00 243. The Use of Arthropod Toxins in Insect Physiology and Toxicology. Raimon L. Beard, Connecticut Agricultural Experiment Station, New Haven.

Arthropod toxins show promise as comparative and diagnostic agents in studying modes of action of insecticides and normal physiology of insect organ systems. Some toxins are general poisons, not species-specific. Others have precise sites of action and may or may not be species-specific. Examples of these in physiologic study are given.

9:12 244. The Anatomy and Histology of the Sting and Poison Glands of the Imported Fire Ant, *Solenopsis saevissima*. Philip S. Callahan, Murray S. Blum, J. Robert Walker, Louisiana State University, Baton Rouge.

Structural details of skeletal parts and musculature of functioning portions of the fire ant sting are described. Cellular structure of the main poison gland and its enveloping poison sac and of accessory Dufour's gland is described and related to two phases of the venom which are known to be present.

9:24 245. The Nature and Properties of the Venom of the Imported Fire Ant, *Solenopsis saevissima*. Murray S. Blum, Philip S. Callahan, Arthur F. Novak and J. Robert Walker, Louisiana State University, Baton Rouge.

By means of three specialized glands, the fire ant produces a mixture of substances comprising its venomous principles. At least two immiscible phases are present, neither of which is water-soluble. A broad spectrum of biological activity is indicated by the insecticidal and antibiotic properties associated with the venom.

9:36 246. The Utilization of Starch Gels or Sponge Rubber in the Electrophoresis of Stable Fly Tryptase. Frank W. Fisk and R. E. Gingrich, Ohio State University, Columbus, and R. A. Patterson, Arizona State College, Tempe.

Attempts to concentrate and possibly fractionate the tryptase present in adult stable flies have made use of paper-, starch gel-, and sponge rubber-zone electrophoresis. The procedures, results and relative effectiveness of these methods are discussed.

9:48 247. Pteridines in the Integument of the Milkweed Bug, *Oncopeltus fasciatus* (Dallas). Bruce W. Hudson, Kaiser Foundation Hospital, San Francisco, California; and Roderick Craig, University of California, Berkeley.

Although xanthopterin and isoxanthopterin are present in the integument in relatively large amounts, there is no evidence that their concentration changes during the molting process.

10:00 248. Some Factors Affecting Development of the Oocytes in the Blattaria. Louis M. Roth and Barbara Stay, Hq. Qm. R&E Command, Qm. R&E Center, U. S. Army, Natick, Massachusetts.

Effects of mating and presence of ootheca on development of oocytes were studied in several blattids. Mating stimulates initial growth of oocytes in *B. vaga, L. maderae, N. cinerea, B. craniifer* and *D. punctata*. In *B. germanica* and *P. surinamensis* cessation of oocyte development, while the female is carrying an ootheca, is due to nervous inhibition.

10:12 249. The Enhancement by Reserpine and Related Compounds of the Effectiveness of Aminopterin, a Folic Acid Antagonist as an Inhibitor of the Development of the Vinegar Fly, *Drosophila melanogaster*. E. D. Goldsmith, New York University College of Dentistry, 342 E. 26th St., New York 10.

Reserpine (Serpasil, Ciba) and several related reserpine compounds were found to increase the effectiveness of a folic acid analogue, aminopterin as an inhibitor of development of vinegar fly larvae. The reserpine compounds in themselves did not alter significantly the emergence values.

10:24 250. Studies on Enzymes in the Salivary Glands of the Large Milkweed Bug, *Oncopeltus fasciatus* (Dall.). E. H. Salkeld, Science Service, Ottawa, Ontario, Canada.

Using microchemical techniques, four digestive enzymes, invertase, amylase, protease, and a lipase were localized in the various lobes of the multilobed salivary glands. Further histochemical studies on the so-called lipase have shown that it is non-specific esterase and not a true lipase.

10:36 Recess

10:48 251. Sexual Differences in Blood Proteins Among Orthopteroid Insects. W. P. Stephen, Oregon State College, Corvallis.

Studies on blood proteins of 14 species of Orthopteroid insects confirmed published data that sexual differences are usually expressed quantitatively, and occasionally qualitatively. Evidence of initial quantitative change in Hemimetabola can be seen during last nymphal instars, whereas in Holometabola development of sexual organs in larva cannot be detected electrophoretically.

11:00 252. The Blood and Cuticular Pigments of the Tobacco Hornworm, *Protoparce sexta* (Johan.). R. T. Yamamoto and G. S. Fraenkel, University of Illinois, Urbana.

Tobacco hornworm larvae reared on potato tubers are light blue to yellow-green. Those reared on leaves are dark green. Spectrometric and chemical analysis of blood and cuticle indicate p-carotene, xanthophyll, and bile (mesobiliverdin) pigments. Colors of potato-reared larvae appear to be due to low concentration of both carotenoid pigments.

11:12 253. Sodium in Cricket Nutrition. Philip C. Stone and Thomas D. Luckey, University of Missouri, Columbia.

A Cerophyl diet plus distilled drinking water produced tiny crickets at 30 days of age. Larger crickets were produced with Cerophyl plus tap water and much larger crickets with Cerophyl plus Universal diet and distilled drinking water. Subsequent feeding tests showed the importance of sodium in the house cricket's diet.

11:24 254. The Effects of 10 G's on the Life Cycle of an Insect. W. N. Sullivan and George E. Westlake, USDA, Beltsville, Maryland.

Vinegar flies, *Drosophila melanogaster* Meigen, were reared from egg to adult in a centrifuge at a continuous force of 10 G's. The time required to go from egg to adult was approximately the same at 10 G's as at normal earth gravitation. Insects may be most useful and convenient organisms for space studies.

11:36 255. Increased Reproduction of Aphids on Plants Affected by the Herbicide 2,4-Dichlorophenoxyacetic Acid. Richard C. Maxwell and Robert F. Harwood, State College of Washington, Pullman.

Even slight dosages of 2,4-D increased the rate of reproduction of pea aphids on broad beams. This is related to an increase in total nitrogen, amino nitrogen, and certain free amino acids. Increased amounts of alanine, aspartic acid, serine, and glutathione on growth terminals were especially evident.

11:48 256. The Structure and Histochemistry of the Connective Tissue of the Sucking Lice. Rudolph L. Pipa and Edwin F. Cook, University of Minnesota, St. Paul.

Internal organs of lice are separated from the haemocoele by connective tissue. The neural lamella consists of two layers of barely resolvable, sinuous, proteinaceous fibrils oriented at right angles to each other. Polarization microscopy indicated a lipid component oriented perpendicular to these fibrils. This tissue contains a neutral mucopolysaccharide, mucoprotein, or glycoprotein.

12:00 257. Further Studies on Post-Irradiation Feeding in *Tribolium castaneum*. W. I. Rogers and J. D. Hilchey, U. S. Army, Natick, Massachusetts.

9:00 a.m.–12:12 p.m.

Section C. Subsection d, Ecology and Bionomics, President's Room

Chairman: J. T. Medler
Secretary: G. G. Gyrisco

Submitted Papers:

9:00 258. An Evaluation of the Field Damage to Corn, Wheat and Beans in Mexico Caused by Certain Insect Pests. William R. Young, Rockefeller Foundation Agricultural Program in Mexico, Mexico, D. F.

A summary will be presented of the results obtained in attempts to estimate the possible ultimate yield losses caused by the following insects in Mexico: *Zeadiatraea lineolata* (Wlk.), and *Laphygma frugiperda* (J. E. Smith) on corn; *Macrosiphum granarium* (Kby.) on wheat, and *Empoasca* spp. and *Diabrotica balteata* Lec. on beans.

9:12 259. Losses Caused by the Sugarcane Borer to Sugarcane in Louisiana. Ralph Mathes, L. J. Charpentier, and W. J. McCormick, ARS, USDA, Houma, Louisiana.

The sugarcane borer, *Diatraea saccharalis* Fab., is the most injurious insect attacking sugarcane in Louisiana. Systematic surveys were conducted from 1935 through 1957. The estimated crop loss for the entire period is 12 percent.

9:24 260. Observations on the Biology and Behavior of *Bembicinus g. godmani* (Hymenoptera: Sphecidae). C. S. Lin, Department of Biology, Huston-Tillotson College, Austin, Texas.

A large compact colony of this small digger wasp was observed. The nest provisioned with 26–30 leafhoppers is 9 cm. long with a slightly enlarged terminal brood chamber. The egg is glued erect on the cell floor. Egg stage, 1 day, larval feeding period, 3 days, and spins cocoon in 1 day.

9:36 261. The Biology of *Melitoma taurea* (Say) in Indiana (Hymenoptera, Anthophoridae). Leland Chandler, Purdue University, Lafayette, Indiana.

Melitoma tuarea (Say) nests gregariously in vertical, clay embankments or in flat, hard-packed soil. The species is biologically variable depending upon site, population density, and upon the geographic area of study. Observations on behavior and nest structure, factors influencing site development and descriptions of the immature stages are given.

9:48 262. Progress in the Development of Wheat Stem Sawfly-Resistant Winter Wheat Varieties. Philip Luginbill, Jr., ARS, Montana State College, and Carl R. Haun, Agronomist, Montana Agricultural Experiment Station, Bozeman.

A sawfly resistant winter wheat was developed from a Yogo (winter wheat) X Rescue (spring wheat) cross. This wheat has been named "Rego" and released for use in the Choteau, Montana, area. This is the first such wheat available to the producer.

10:00 263. Evaluation of Resistance of Corn Leaf Tissue to Feeding by the European Corn Borer. A. K. Burditt, Jr., and F. G. Holdaway, University of Minnesota, St. Paul.

Five related inbred lines of field corn were evaluated for resistance to leaf feeding by European corn borer using field methods and a new laboratory technique, Minnesota resistant lines A288 and A295, susceptible line A291, and their common parents resistant line L317 and susceptible line A344, with essentially similar results.

10:12 264. The Evaluation of European Corn Borer Damage. T. R. Everett, M. L. Fairchild and T. A. Brindley, ARS, USDA, Iowa State College, Ames.

Various indices of infestation and damage are presented and evaluated as methods for determining the reduction in yield by European corn borer. The use of an index by research and survey entomologists will be discussed.

10:24 265. Some Biological Effects of Rearing European Corn Borer on Susceptible and Resistant Corn Hybrids: Weight, Length of Life, Fecundity, and Fertility. V. E. Anderson, Iowa Agricultural Experiment Station, and T. R. Everett, ARS, USDA, Ames.

Larvae reared on resistant corn were found to be lighter in weight. Pupae collected from late planted corn at midsummer were also lighter in weight. Fecundity and fertility of moths is also influenced by the larval habitat.

10:36 Recess

10:48 266. Mating Behavior and Occurrences of Sexual Forms in and between 22 Lines of Pea Aphids, *Acyrthosiphon pisum* (Harr.) (*Macrosiphum pisi* (Kalt.)). J. J. Cartier, Science Service Laboratory, St. Jean, Quebec, Canada.

Twenty-two lines of pea aphids, reared on Perfection peas, were submitted to a 7½-hour photoperiod. Apterous oviparous females were obtained in thirty days. Males matured five days later. Observations on the relations of mating behavior and occurrence of sexual forms to the biotypes of the pea aphid will be discussed.

11:00 267. Comparative Effects of Starvation Periods Against Rearing Periods on a Resistant Pea Variety on the Growth of the Pea Aphid, *Acyrthosiphon pisum* (Harr.). J. L. Auclair and J. J. Cartier, Science Service Laboratory, St. Jean, Quebec, Canada.

Weight of aphids reared continuously on resistant Onward was comparable to aphids starved 10 hours daily, and weight of aphids reared on Onward 14 hours daily to aphids starved 8 hours daily, remainder of each day being spent on susceptible Perfection. Aphid growth on resistant Onward was similar to aphids subjected to semi-starvation.

11:12 268. The Production of the Agamic Alate Form of the Spotted Alfalfa Aphid, *Therioaphis maculata* (Buckton). John D. Paschke, Illinois State Natural History Survey, Urbana.

Factors known to influence production of alatae in other species of aphids have been investigated with regard to production of alate forms of spotted alfalfa aphids. Evidence from laboratory experiments and field populations demonstrated the primary factor responsible for the production of alatae is population density or "crowding" of aphids.

11:24 269. Effect of Different Varieties of Alfalfa on the Biology of the Spotted Alfalfa Aphid in Arizona. M. W. Nielson and W. E. Currie, ARS, USDA, Mesa, Arizona.

The length of life history, rate of reproduction, and adult longevity of the spotted alfalfa aphid was greater on susceptible (Chilean 21-5 and African) than on resistant (Lahontan and Moapa) varieties. A greater proportion of aphids failed to reproduce and complete their life history on resistant varieties.

11:36 270. A Biotype of the Spotted Alfalfa Aphid, *Therioaphis maculata*, on Alfalfa. G. R. Pesho and F. V. Lieberman, ARS, USDA, Bakersfield, California.

Spotted alfalfa aphids capable of developing on resistant plants were found at El Centro, California, in 1958. These aphids constitute a new biotype that thrives on several non-dormant clones still resistant to original population. Studies are underway to determine its potential effect on resistant varieties and their components.

11:48 271. Formation and Development of a Complex Aphid Gall on Cottonwoods. Carlo M. Ignoffo, Iowa Wesleyan College, Mt. Pleasant, and Alexander A. Granovsky, University of Minnesota, St. Paul.

Studies have been conducted on stimulation, initiation and development of a complex prosoplastic gall which is produced on terminal apices of cottonwoods, *Populus deltoides* Marsh. by the aphid *Mordwilkoja vagabunda* Walsh. Morphological and histological changes occurring during gall development and interpretations of the feeding stimulus in tissue alteration will be considered.

12:00 272. The Life History and Ecology of a Gall Producing Aphid, *Mordwilkoja vagabunda* Walsh. Carlo M. Ignoffo, Iowa Wesleyan College, Mt. Pleasant, and Alexander A. Granovsky, University of Minnesota, St. Paul.

A major portion of the presentation will be devoted to the life history of the gall aphid as it occurs in Minnesota. Consideration also will be given to daily and seasonal migration of the alates from galls as well as to population build up within developing galls.

9:00 a.m.–12:12 p.m.

Section D. Medical and Veterinary Entomology, Junior Ballroom

Chairman: D. R. Johnson
Secretary: Herbert Knutson

Submitted Papers:

9:00 273. The Localizing Effect of Man on the Mosquito *Mansonia perturbans*. W. E. Snow and Eugene Pickard, Tennessee Valley Authority, Wilson Dam, Alabama.

Field tests to determine the localizing effect of man on *Mansonia perturbans* were made by use of human subjects beneath drop net and in parked car during the early evening activity period. Records from five tests showed that sizable residual groups of mosquitoes occurred only when man was present.

9:12 274. Mosquito Transmission of Rabbit Fibromatosis. Herbert T. Dalmat, National Institutes of Health, Bethesda, Maryland.

A variety of techniques indicated that the virus of rabbit fibromatosis is mechanically transmitted, the demonstrated stability of the virus accounting, at least in part, for the prolonged infectivity of mosquitoes. However, transmission occurs only when mosquitoes penetrate primary infective tumors, not if their mouthparts are bathed externally with virus.

9:24 275. Studies on *Haemagogus equinus* Theobald and *H. mesodentatus* Kumm and Komp. Paul A. Woke, National Institutes of Health, Bethesda, Maryland.

Current studies on bionomics in the laboratory and observations in the forest habitat will be reported.

9:36 276. An Altitude Biting Study of *Culex tritaeniorhynchus* (Giles) in Japan. Maj. Milton B. Flemings, First U. S. Army Medical Laboratory, 90 Church Street, New York.

Culex tritaeniorhynchus will bite black-crowned night herons at all levels from the ground to fifty feet. Biting rates are overwhelmingly higher at ground level. The relationship between Japanese encephalitis and biting rate at ground level will be discussed.

9:48 277. Reduction in the Reproductive Rate of *Anopheles quadrimaculatus* Caused by the Presence of Irradiated Males in a Normal Population. A. N. Davis, J. B. Gahan, Donald E. Weidhaas and Carroll N. Smith, ARS, USDA, Orlando, Florida.

When irradiated males of *Anopheles quadrimaculatus* were introduced into populations of normal males and females at ratios of 4:1:1 there was usually no reduction in the total number of viable eggs produced. At ratios of 6:1:1 and 10:1:1 the number of viable eggs was reduced about 80%.

10:00 278. What Should be the Status of the Mosquito *Aedes triseriatus hendersoni* Cockerell? Osmond P. Breland, University of Texas, Austin.

Recent studies have shown the presence of at least two entities in the species complex now recognized as *Aedes triseriatus* Say. These studies have raised new problems, but present evidence indicates that the name, *hendersoni*, should be restored, and that this taxon should probably be raised to full specific rank.

10:12 279. Directional Flight of the Mosquito, *Aedes vexans*. William R. Horsfall, University of Illinois, Urbana.

A trapping procedure has been devised and applied to flights of *Aedes vexans*. The procedure may be adaptable to insects that move in a similar manner.

10:24 280. A Comparison of Four Different Diets for the Routine Laboratory Rearing of Adult *Aedes aegypti* (L.). J. N. Liles, R. Meola and D. M. DeLong, Ohio State University, Columbus.

A comparison of longevity, fecundity, egg viability, and growth rate of successive generations will be presented for adult *Aedes aegypti* (L.) fed the following diets: live mouse plus sucrose solution, egg albumen plus sucrose solution, hemolyzed beef blood plus sucrose, and an amino acid mixture containing salts and sucrose.

10:36 Recess

10:48 281. Spontaneous Mutations as Genetic Markers in *Aedes aegypti*. George B. Craig, Jr., University of Notre Dame, Indiana.

Seven spontaneous Mendelian characters which can be used as markers and testers were discovered. They are: larval pigmentation; abdominal tergites covered with white scales; mesonotum with golden scales; palps with white scales reduced or absent; abdomen with lateral white spots absent in male, expanded in female; tarsi with white bands absent.

11:00 282. Multiple Fertilization Demonstrated in *Aedes aegypti*. Robert C. VandeHey and George B. Craig, Jr., University of Notre Dame, Indiana.

Genetically marked (yellow and dark larvae) *Aedes aegypti* were crossed to study possible multiple fertilization. Results indicate that females can utilize sperm from several males in the production of a single clutch of eggs.

11:12 283. Sensitization of Rabbits by Bites and Extract of *Aedes aegypti* and Indication of Specific Antibody Formation. Anne Hudson and A. S. West, Queen's University, Kingston, Ontario, Canada, and A. S. West, Rutger's State University, New Brunswick, New Jersey.

Sensitization of rabbits to bites and injected extracts of *Aedes aegypti* has been effected. The production of an allergic condition is indicated. Serum from sensitized rabbits contains a lysin for sheep cells in the presence of complement. Serological tests indicate a factor in mosquito material which behaves like a Forssman antigen.

11:24 284. Effect of Varying Test Conditions on the Toxicity of Mosquito Larvicides in a Standard Laboratory Testing Technique. Claude H. Schmidt and Donald E. Weidhaas, Entomology Research Division, USDA, Orlando, Florida.

The volume and depth of suspensions used in larvicide tests had an effect on the mortality of certain species of mosquito larvae with some insecticides but not with others.

11:36 285. Toxicological Action of DDT on Three Species of Mosquito Larvae. Donald E. Weidhaas and Claude H. Schmidt, Entomology Research Division, USDA, Orlando, Florida.

The absorbed dose of C^{14}-DDT required to give a certain mortality of fourth-instar larvae of *Anopheles quadrimaculatus*, *Aedes aegypti*, and *Aedes taeniorhynchus* varied with the time and concentration used.

11:48 286. Variation in the Characteristic Features of Larvae of *Anopheles freeborni* Aitken (Culicidae, Diptera) from the Type Locality. Jalil K. Abul-hab, University of California, Davis.

An analysis of the larvae of *A. freeborni* reared from females taken at the type locality showed a considerable amount of variation among individuals of the same progeny. This variation may confuse the identity of the larvae of this species with those of related species when found together.

12:00 287. A Seasonal History of Mosquito Larval Populations in Salt Lake County, Utah. Jay E. Graham and Russell D. Anderson, South Salt Lake County Mosquito Abatement District, Midvale, Utah.

Detailed studies of mosquito larval populations conducted by the South Salt Lake County Mosquito Abatement District from 1956 through 1958 disclosed consistent seasonal patterns for each species which are related to the biology of the species and to the conditions that produce the larval habitats.

9:00 a.m.–12:24 p.m.

Section F. Chemical Control Investigations, Lafayette Ballroom

Chairman: P. A. Dahm
Secretary: Donald W. Davis

Submitted Papers:

9:00 288. A Study of the Optimum Time of Application of DDT Granules and Emulsion for the Control of the European Corn Borer. E. E. King, Iowa State College, and M. L. Fairchild and T. A. Brindley, ARS, USDA, Ames.

Experiments were conducted at Ankeny, Iowa, in 1957 and 1958 to study the effect of the time of application of DDT granules and emulsion. The data collected in 1956 and 1957 indicate a difference in the optimum time of application of DDT granules and DDT emulsion for corn borer control.

9:12 289. Damage to Louisiana Corn at Harvest and Progressive Loss During Storage Caused by Stored Grain Insects. E. H. Floyd, A. D. Oliver, and L. D. Newsom, Louisiana State University, Baton Rouge.

A 3-year study in Louisiana showed near 10 per cent kernel damage to corn at harvest. Damage (primarily due to rice weevil) increased to approximately 30 per cent by mid-summer. Infestation occurred in the field and progressed in storage. Certain areas were more heavily infested than others.

9:24 290. Granular Toxaphene, Heptachlor, and Endrin for European Corn Borer Control. M. L. Fairchild, ARS, USDA, and T. A. Brindley, Iowa State College, Ames.

Experiments were conducted 1956–58 to determine the effect of varying rates of granular toxaphene, heptachlor, and endrin on first and second brood European corn borers. At the rates tested there was very little difference between the effectiveness of the three insecticides.

9:36 291. Greenbug Control with Systemics as Influenced by Fertilizer Applications. Norris E. Daniels, Texas Agricultural Experiment Station (Southwestern Plains Field Station), Bushland.

Data secured in 1956–58 showed that greenbug control with the systemic phosphorus compounds demeton and Di-syston was little or no better when used in combination with different rates of nitrogen and phosphorus fertilizers than when used alone.

9:48 292. Cotton Insect Control and Cotton Yields. John S. Roussel, Louisiana State University, Baton Rouge.

A discussion of increased yields of cotton resulting from insect control in experimental plots since 1920 will be given. An analysis of effective control on cotton production will also be discussed.

10:00 293. Effectiveness of Different Types of Spray Nozzles for Controlling Cotton Insects. J. C. Gaines and Perry L. Adkisson, Texas A & M College System, College Station.

Conventional and wide swath jet type spray nozzles were evaluated for control of the cotton bollweevil (*Anthonomus grandis* Boh.) and cotton bollworm (*Heliothis zea* Boddie). Effective control of the bollweevil was obtained only with the one number 6 nozzle or two number 3 nozzles per row. Control of the bollworm was obtained with all the nozzle types tested.

10:12 294. Population Increases in Three Species of Mites on Alfalfa following Insecticide Applications. E. C. Klostermeyer and Wyatt W. Cone, State College of Washington, Prosser.

DDT applications to alfalfa cause increases of two-spotted mites; dieldrin and endrin increase *Typhlodromus cucumeris*, and schradan and other phosphates increase *Tydeus* sp. Biotic as well as direct insecticide effects are involved in the population increases.

10:24 295. Effect of Spider Mite Populations and Winter Treatments on Winter Survival of Outdoor Roses. Edgar A. Taylor, Thomas J. Henneberry and Floyd F. Smith, ARS, USDA, Beltsville, Maryland.

Results obtained in experimental outdoor roses at Beltsville, Maryland, have indicated a highly significant negative correlation between summer populations of the two-spotted spider mite (*Tetranychus telarius* L.) and the number of healthy canes surviving the following winter season.

10:36 Recess

10:48 296. Laboratory Evaluation of Acaricides Against the Two-Spotted Mite. P. C. Lippold, Niagara Chemical Division, Middleport, New York.

Several acaricides were evaluated against a parathion-susceptible strain of the two-spotted mite, *Tetranychus telarius* (L.), in laboratory studies. Percent control was noted 2½ days after treatment. Ethion was one of the more effective materials tested.

11:00 297. Resistance of *Tetranychus cinnabarinus* (Bois.) to Organic Phosphates in Arizona. Paul D. Gerhardt, and George P. Wene, University of Arizona, Mesa and Tempe.

Laboratory tests showed that the mite, *T. cinnabarinus* (Bois.) were found to be resistant to organic phosphate insecticides. A field experiment conducted on sugar beets confirmed the laboratory tests. At present, this resistant mite is confined to the Litchfield Park area and has been found on cotton, watermelons, sugar beets and roses.

11:12 298. Application of Systemic Insecticides at Planting for Control of the Two-Spotted Spider Mite on Beans. J. Wilcox and A. F. Howland, ARS, USDA, Whittier, California.

Liquid and/or granular applications of Thimet, Di-Syston, Guthion, Bayer 23129, 25141 and 29493, demeton, American Cyanamid 12880 and 18706, and Monsanto 8574 and 18706 were applied in the ground with seed at planting. Foliage sprays were applied six weeks after planting. Some systemics show promise of long-lasting mite control.

11:24 299. Comparative Residue Behavior of Pyrethrins and Piperonyl Butoxide on Wheat. R. C. Blinn, R. W. Dorner, R. G. Strong, H. W. Siess, Jr., and F. A. Gunther, University of California, Riverside.

By the use of chromatographic techniques in conjunction with colorimetric procedures, the residue behavior of pyrethrins and of piperonyl butoxide on stored wheat have been compared. Pyrethrins has an apparent residue half-life of about 4 weeks as contrasted to about 6 weeks for piperonyl butoxide.

11:36 300. Locale of Aged Tedion Residues on Citrus Fruits. R. C. Blinn, R. W. Dorner, J. H. Barkley, L. R. Jeppson, F. A. Gunther, University of California, Riverside, and C. C. Cassil, Niagara Chemical Division, Richmond, California.

About 90% of aged Tedion residues on oranges exist within the waxy cuticle, however, not uniformly throughout. It was found that about 56% was co-extracted with about 2% wax. Also, about 60% of aged residual Tedion on field-treated lemons can be removed during commercial washing operations.

11:48 301. A Qualitative Study of the Arthropod Fauna from Five Selected Drain Ditches in Salt Lake County, Utah. Russell D. Anderson and Jay E. Graham, South Salt Lake County Mosquito Abatement District, Midvale, Utah.

Five selected drain ditches were treated with "Ortho Aquatic Weed Killer" No. 60 at approximately 300 parts of weed killer per million parts of water. This material consistently killed the following arthropods: Coleoptera, Diptera, Odonata, Hemiptera and Crustacea.

12:00 302. Laboratory Tests for the Control of the Sugar Beet Leafhopper and/or Curly Top on Snap Beans Grown for Seed. W. E. Peay, ARS, USDA, Twin Falls, Idaho.

Laboratory tests of over a hundred chemicals for the control of the beet leafhopper *Circulifer tenellus* (Bak.) on snap beans grown for seed show nine materials warrant field trials. Thimet used in combination with an extract of sugar beets highly resistant to curly top was consistently outstanding on beans and tomatoes.

12:12 303. Use of Light Traps to Control the Striped Cucumber Beetle. Howard O. Deay, Purdue University, Lafayette, Indiana.

During 1958 fan-type electric light traps, equipped with three 15-watt Black Light lamps, protected cucumbers from striped cucumber beetles. Traps with one 15-watt Black Light lamp or with a 15-watt green fluorescent plus a 15-watt Black Light lamp gave less protection than did three 15-watt Black Light lamps.

INDEX OF ABSTRACTS BY SENIOR AUTHOR

Number following name of author indicates location of paper in program.

Abul-hab, J. K., 286
Al-Azawi, A., 211
Allen, R. K., 76
Anderson, L. D., 206
Anderson, R. D., 301
Anderson, V. E., 265
Anthon, E. W., 166
Ashrafi, S. H., 25
Atkins, E. L., Jr., 133
Auclair, J. L., 267

Baker, E. W., 220
Barnes, D., 139
Barnes, M. M., 168, 231
Bean, J. L., 102
Beard, R. L., 243
Beirne, B. P., 10
Belkin, J. N., 131
Bennett, A. G., 162
Berry, N. O., 50
Bieberdorf, G. A., 137
Bigley, W. S., 142
Blinn, R. C., 299, 300
Blum, M. S., 245
Bohart, G. E., 94, 182
Bonhag, P. F., 13
Boudreaux, H. B., 72, 221
Bowman, J. S., 21
Brannon, D. H., 164
Bready, J. K., 171
Breland, O. P., 278
Brown, A. W. A., 116
Brown, L. R., 71
Buchanan, W. D., 210
Burditt, A. K., Jr., 263
Burgess, E. D., 51
Buxton, J. A., 77

Callahan, P. S., 244
Camin, J. H., 37
Carter, G. F., 240
Cartier, J. J., 266
Chamberlin, J. C., 69
Chandler, L., 261
Chang, S. C., 186, 187
Chattoraj, A. N., 191
Cheng, T. H., 149, 150
Clyde, G. D., 1
Colberg, W., 158
Corey, R. A., 59
Corrigan, J. J., 193
Cox, H. C., 224
Craig, G. B., Jr., 281
Crawford, C. S., 226
Crosby, J. E., Jr., 52

Dalmat, H. T., 274
Daniels, N. E., 291
Darling, T. G., 236, 239
Dauterman, W. D., 23
Davis, A. N., 277
Davis, C. S., 154
Davis, D. W., 165
Deal, A. S., 161
Deay, H. O., 303
DeBach, P., 33
Dickson, R. C., 215
Dorward, K., 233
Doucette, C. F., 175
Downes, J. A., 181
Drummond, R. O., 147
Durkin, J. J., 125

Eads, C. O., 111
Earle, N. W., 228
Ebeling, W., 57
Eckert, J. E., 132
Edmunds, G. F., Jr., 7, 75, 108
Edmunds, L. R., 45
Ehrlich, P. R., 74
Eldefrawi, M. E., 27
Ellertson, F. E., 232
Everett, T. R., 264
Every, R. W., 120

Fairchild, M. L., 290
Feingold, B. F., 43
Field, G., 152, 153
Fisk, F. W., 246
Flebut, A., 123
Flemings, M. B., 276
Flock, R. A., 218, 219
Floyd, E. H., 289
Frick, K. E., 208
Frischknecht, C., 118
Fukuto, T. R., 14, 16
Furman, D. P., 49

Gaines, J. C., 293
Gates, D. E., 55
Gerhardt, P. D., 297
Gersdorff, W. A., 178
Gojmerac, W. L., 140
Goldsmith, E. D., 249
Goulding, R. L., 148
Graham, J. E., 287
Grigarick, A. A., 97a

Hagen, K. S., 180
Haines, T. W., 39
Hall, I. M., 92
Haller, H. L., 233
Hansberry, R., 8
Harbison, C. F., 184, 185
Hardy, D. E., 81, 82
Harein, P. K., 66
Harper, R. W., 53
Haws, L. D., 143
Heal, R. E., 63
Henneberry, T. J., 223
Hitchcock, J. D., 209
Holmes, J. H., 119
Hoopingarner, R., 204
Hopla, C. E., 38
Horsfall, W. R., 279
Hoskins, W., 9
Hovanitz, W., 129
Howell, J. F., 93
Hudson, A., 283
Hudson, B. W., 42, 247
Huffaker, C. B., 34, 85

Ignoffo, C. M., 271, 272

Jenkins, D. W., 112
Jensen, D. D., 216
Johansen, C. A., 6, 138
Johnston, H. R., 107
Jones, G., 159

Kearns, C. W., 114
Kilpatrick, J. W., 48
King, E. E., 288
Kishaba, A. N., 198
Klostermeyer, E. C., 294
Knight, F. B., 105
Knowlton, G. F., 156
Knutson, H., 117
Kowal, R. J., 103
Krantz, G. W., 179
Kreasky, J. B., 229
Krueger, H. R., 22
Kyd, S., 155

Landgraf, A. E., 99
Lange, W. H., 170
Lattin, J. D., 5, 80
Lauderdale, R. W., 157
LaBerge, W. E., 180
Levin, M. D., 199, 200
Lichtenstein, E. P., 172, 173, 174
Liles, J. N., 280
Lin, C. S., 260
Lindquist, A. W., 35
Lipke, H., 189, 190
Lippold, P. C., 296
Luginbill, P., Jr., 262

Maddock, D. R., 44, 47
Mallis, A., 225
March, R. B., 115
Marshall, E. R., 60
Massey, C. L., 97, 104
Mathes, R., 259
Matthysse, J. G., 146
Maxwell, R. C., 255
McCauley, W. E., 235
McGregor, S. E., 134
McLean, D. L., 214
Mendenhall, W. T., 237
Mengle, D. C., 26
Menn, J. J., 20, 197
Meola, R. W., 177
Merrill, L., 124
Metcalf, R. L., 3, 15
Milem, P. E., 205
Monro, H. A. U., 62
Mulla, M. S., 61, 176

Nagel, R. H., 106
Nielsen, G. R., 110
Nielsen, L. T., 84
Nielson, M. W., 269
Norris, D. M., Jr., 212
Nye, W. P., 70, 201, 202

O'Brien, R. D., 28
Orgell, W. H., 24
Orr, L. W., 98

Paschke, J. D., 268
Patton, W. P., 54
Peay, W. E., 302
Pedersen, J. R., 64
Perry, A. S., 192
Pesho, G. R., 270
Pfadt, R. E., 230
Philip, C. B., 40
Philpott, C. W., 36
Pickett, A. D., 30
Pipa, R. L., 256
Plapp, F. W., Jr., 196
Pollard, H. N., 217
Portman, R. W., 160
Puttler, B., 96

INDEX OF AUTHORS (Continued)

Reagan, E. P., 50
Reynolds, H. T., 194
Richards, A. G., 11
Riehl, L. A., 169
Roan, C. C., 67
Robb, T. R., 163
Rodriguez, J. G., 195
Rogers, W. I., 257
Rogoff, W. M., 19, 145
Roney, J. N., 122
Ross, H. H., 130
Roth, A. R., 144, 151
Roth, L. M., 248
Rothenbuhler, W. C., 203
Roussel, J. S., 292
Rowell, J. O., 158
Rozeboom, L. E., 127
Ryan, H. J., 234
Ryckman, R. E., 78, 79

Sailer, R. I., 128
Salkeld, E. H., 250
Schlinger, E. I., 89
Schmidt, C. H., 188, 284
Schmiege, D. C., 101
Schoof, H. F., 113
Schwardt, H. H., 121
Seume, F. W., 18
Sheets, L. W., 87
Sherman, M., 141
Simmonds, F. J., 29
Smith, C. N., 46
Smith, R. F., 12, 32
Snapp, O. I., 167
Snow, W. E., 273
Soderstrom, E. L., 227
Soper, F. L., 4
Speers, C. F., 109
Stark, H. E., 41
Steiner, L. F., 238
Stephen, W. P., 207, 251
Stern, V. M., 56
Sternburg, J., 17
Stone, A., 83
Stone, P. C., 253
Strong, F. E., 91
Sullivan, W. N., 254
Swenson, K. G., 213
Swift, J. E., 118

Tanada, Y., 31
Tarshis, I. B., 58
Taylor, E. A., 295
Thomas, H. A., 86
Todd, F. E., 132
Turnbull, A. L., 95

VandeHey, R. C., 282
van den Bosch, R., 88

Walker, D. W., 68
Waters, W. E., 183
Weaver, J. N., 135
Weidhaas, D. E., 285
Wheeler, M. R., 126
Whitney, W. K., 65
Wilford, B. H., 100
Wilcox, J., 298
Williams, C. M., 241
Woke, P. A., 275
Woodrow, A. W., 136
Woolley, T. A., 73, 222

Yamamoto, R. T., 252
York, G. T., 90
Young, W. R., 258

NOTES

NOTES

NOTES

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PROCEEDINGS OF THE TWENTY-NINTH ANNUAL MEETING OF THE EASTERN BRANCH, ENTOMOLOGICAL SOCIETY OF AMERICA

New York City, New York, November 25 and 26, 1957

The twenty-ninth annual meeting of the Eastern Branch, Entomological Society of America, was held at the Commodore Hotel, New York City, Monday and Tuesday, November 25 and 26, 1957. C. C. Alexander, Chairman and Neely Turner, Vice-Chairman presided during the two-day meeting where 39 papers were presented. The opening session began with remarks from H. M. Armitage, President of the parent association who was followed by the Executive Secretary, Robert H. Nelson. These remarks were followed by a report of the Eastern Branch Representative to the Governing Board of the E.S.A. by Bailey B. Pepper. The remainder of the opening morning session was devoted to a panel discussion, "Elements of Entomology", Moderator, Bennet A. Porter. The discussions included (1) The Man, by Kenneth L. Knight; (2) The Insect, by Reece I. Sailer; (3) The Program by Robert Glen and (4) The Economics by George R. Ferguson.

On Monday evening an ornamental session was presided over by Harvey Barke and on Tuesday morning another panel discussion "An Appraisal of the Gypsy Moth and Other Mass Insect Control Programs" was moderated by Charles E. Palm. Emory D. Burgess discussed "Its Objectives and Accomplishments". Neely Turner presented "Another Viewpoint", and "Its Effect on Fish and Wildlife" was summarized by Oliver B. Cope and Paul F. Springer of Fish and Wildlife Service, U.S.D.I.

At a short business meeting the afternoon of the first day the report of the secretary-treasurer was given and the financial statement presented was referred to the Auditing Committee. Chairman Alexander appointed the following committees to report back at the final business meeting.

Nominations: E. H. Glass, Dean Asquith, E. H. Wheeler, *Chairman*

Auditing: M. M. Darley, A. M. Woodside, *Chairman*

Resolutions: T. L. Bissell, J. B. Kring, N. D. Blackburn, *Chairman*

Financial Statement

Balance on hand November 5, 1956	$866.87
Receipts during the year	496.00
Total	$1362.87
Disbursements during the year	474.64
Balance on hand November 5, 1957	888.23
Total	1362.87

A complete financial report was presented at the meeting and is in the files of the undersigned.

Byrley F. Driggers
Secretary-Treasurer

Report of the Resolutions Committee

Whereas, the following members have passed away since the last meeting of the Eastern Branch,

Be it resolved, that the Eastern Branch of the Entomological Society of America, through its secretary, extend sympathy to their families: A. G. Boving, N. S. Easton, Ina L. Hawes, Robert D. Kennedy, Robert Lambert, John C. Martin, T. B. McGuire, J. G. Needham.

Whereas, officers and committees of the Eastern Branch have arranged for a successful meeting,

Be it resolved, that the members of the Eastern Branch express their grateful appreciation for the leadership of its officers and the excellent work of the program committee and others who have contributed to the success of the meeting.

Whereas, H. M. Armitage, President of the Entomological Society of America, R. H. Nelson, Executive Secretary, and B. B. Pepper, Eastern Branch Representative to the Governing Board, have presented such excellent reports of our Society.

Be it resolved, that the Eastern Branch express its sincere appreciation to President Armitage, Secretary Nelson and Representative Pepper for their leadership and for their attendance at our annual meeting.

Whereas, two excellent panel discussions have been enjoyed by the meeting,

Be it resolved, that the members of the Eastern Branch extends its appreciation to all participants for an outstanding presentation.

Whereas, the management of the Hotel Commodore has provided excellent facilities for our meeting,

Be it resolved, that we express our appreciation to the management of the Hotel Commodore.

Respectfully submitted,
T. L. Bissell
J. B. Kring
N. D. Blackburn, *Chairman*

Report of Eastern Branch Representative on the Governing Board of the Entomological Society of America

Since the last meeting of the Eastern Branch in Atlantic City your representative to the Governing Board had the honor of attending the annual meeting of the Parent Society in New York City. The Governing Board met and conducted its business, consuming the better part of the entire meeting of the Society. The actions of the Governing Board are reported by the Executive Secretary in the March issue of the "Bulletin".

During the year there has been a great volume of correspondence between your representative and the president and other member of the Board. It is regrettable that there has been a difference of opinion between your representative and the president concerning the handling of the amendments to the constitution and by-laws as published in the Bulletin for March 1957. The writer took it upon himself personally to get a legal interpretation on the President's action.

Your Representative plans to attend the annual meeting in Memphis and the Governing Board meetings beginning Saturday November 30, 1957. There are many important items on the Board's Agenda on which your instructions are welcome.

1. Increase in membership dues to provide,
   a. Additional paid editorial staff
   b. Travel expenses of President, President-elect, Board Members, etc.
   c. Permanent Headquarters
   d. Salary increases for staff
   e. Centralization of Publication Storage
   f. New Office equipment
2. Admendments to amendments to constitution and by-laws
3. Standing Committee on Research Funds
4. Past President Advisory Committee
5. Enlarge Executive Committee
6. Define America
7. Reject Establishment of Division in Society
8. Modify the official status of sections
9. Allocation of Program Time
10. Nominations to standing committees
11. Summer meetings
12. Improve Society-Branch Relations
13. Committee Reports

Your representative to the Governing Board invites each and every member of the Branch to express his wishes and thoughts concerning the Society affairs.

Respectfully submitted,
BAILEY B. PEPPER, *Representative*

Report of Membership Committee Eastern Branch, ESA

The Eastern Branch continued in 1957 the membership campaign which was begun in 1956 under the able leadership of A. C. Miller. This year's campaign has added another 72 members to the Branch and has resulted in the Eastern Branch taking the No. 1 position among the branches, closely followed by the Pacific Branch. There are now 1189 members in the branch including those whose subscriptions begin in 1958.

These members were obtained through the efforts of our national office, the membership committee of the parent society but mainly through the 30 members of our membership committee who worked in fourteen states, the District of Columbia, and Canada. News letters in July and September informed committee members of the progress of our chairman.

Respectfully submitted,
ELTON J. HANSENS, *Chairman*

Report of the Auditing Committee

Your Auditing Committee has examined the financial statement, books, and records of the Secretary-Treasurer, B. F. Driggers, and finds them correct and in good order.

Respectfully submitted,
M. M. DARLEY
A. M. WOODSIDE, *Chairman*

Report of the Nominating Committee

Your committee proposes the following names to serve as officers of the Eastern Branch, E.S.A. for 1958:

Chairman: Neely Turner
Vice-Chairman: Reece I. Sailer

The slate presented by the *Nominating Committee* were duly elected.

The *Executive Committee* reported the Lord Baltimore Hotel in Baltimore, Maryland as their selection for the meeting place in 1958 and the dates, Monday and Tuesday, November 24th and 25th, 1958. The membership voted to approve the selection of the time and place for the 30th annual meeting.

Chairman Turner subsequently appointed the following committees to serve in 1958: *Program Committee:* B. G. Anderson, C. L. Hovey, E. J. Duda, A. E. Badersher, Ashley B. Gurney, *Chairman. Resolutions Committee:* Philip Granett, W. E. Bickley, Philip J. Spear, A. C. Davis, *Chairman. Nominations Committee:* John Lukel, C. C. Alexander, P. J. Chapman, *Chairman. Auditing Committee:* T. W. Kerr, J. O. Pepper, *Chairman. Membership Committee:* Geddes Simpson, *Chairman. Sustaining Associates:* Thaddeus Parr.

Respectfully submitted,
BYRLEY F. DRIGGERS, *Secretary-Treasurer*

SECRETARYSHIP OF THE INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE

The International Trust for Zoological Nomenclature announces with great regret that it has been informed by Mr. Francis Hemming, who has held the Office of Honorary Secretary to the International Commission on Zoological Nomenclature since 1936, that he has been told by his medical advisers that he must seek immediate relief from at least the greater part of his duties and that he ought not to incur the physical strain involved in completing the arrangements for the Colloquium on Zoological Nomenclature which is to be held in London next July immediately before the meeting of the Fifteenth International Congress of Zoology. At the same time Mr. Hemming, when informing the President of the International Commission, intimated that he did not propose to offer himself for re-election as Honorary Secretary for the period following the close of the coming Congress.

The situation created called for immediate action by the Trust since if any serious break were to occur in the preparations for the Colloquium the prospects for securing the final adoption by the Congress of a revised text for the International Code of Zoological Nomenclature would be seriously compromised.

The International Trust has pleasure in announcing the following arrangements which it has made in consultation with Sir Gavin de Beer, Director, British Museum (Natural History), and President of the coming Fifteenth International Congress of Zoology:—

(1) With the consent of Sir William Pugh, Director of the Geological Survey, London, and with the approval of the Department of Scientific and Industrial Research and of H.M. Treasury, Mr. R. V. Melville, a senior member of the Palaeontological staff of the Survey, has been released for a period of one year to take immediate charge of the Office of the Commission with the title of "Assistant Secretary to, and Director of the Office of, the International Commission on Zoological Nomenclature". In addition, Mr. Melville has been appointed Assistant Manager to the Trust.

(2) Mr. Melville will take up his new duties on Thursday, 1st May, 1958.

(3) Mr. Melville's first duty will be to obtain suitable accommodation for the Office of the Commission (which hitherto has been housed rent-free in Mr. Hemming's private residence) and to complete the arrangements for the meeting of the Colloquium on Zoological Nomenclature.

(4) At the request of the Trust and in order to assist Mr. Melville to concentrate his attention on the most urgent tasks, Mr. Hemming has consented to see through the press the edition of the *Official Lists* and *Official Indexes* now in the course of being printed and, in addition, to prepare the *Opinions* required to give effect to the decisions already taken by the Commission in a number of cases. Mr. Hemming has also agreed for the time being to retain the position of Managing Director and Secretary of the Trust.

In view of the close association between the work of the Section on Nomenclature of the International Congress of Zoology and the work of the Colloquium on Zoological Nomenclature, Sir Gavin de Beer, as President of the Congress, has invited Mr. Melville to act as Recorder for the Section in succession to Mr. Hemming.

AMERICAN PHYTOPATHOLOGICAL SOCIETY

The year 1958 is the Golden Jubilee Anniversary of the American Phytopathological Society. At their meeting with the A.I.B.S. at Bloomington, Indiana in August they sponsored a series of outstanding symposia participated in by internationally known scientists.

The papers presented at these symposia will be published by the Phytopathological Society. The following summary statement will be of interest.

Title of Volume:	Plant Pathology—Problems and Progress, 1908–1958.
Description:	Approximately 1000 pages, book binding, 6 x 9 inches, illustrated.
Price:	$8.50
Order From:	American Phytopathological Society, P.O. Drawer 1106, New Haven 4, Connecticut.
Publication Date:	Winter, 1958.

ENTOMOLOGICAL SOCIETY OF CANADA

The October 29–November 1, 1958 meeting of the Entomological Society of Canada, combined with the Entomological Society of Ontario, is noted in the meetings column. The following symposia are on the program of this meeting. These are pertinent and timely.

TRENDS IN CANADIAN ENTOMOLOGY, *Chairman*, Robert Glen

INSECT DISPERSAL, *Chairman*, J. A. Downes

METABOLISM OF INSECTICIDES, *Chairman*, E. Y. Spenser

There will be one morning and one afternoon session for reading of submitted papers. A smoker, a banquet and a ladies program are all arranged. A Canadian welcome awaits you.

POSITIONS OPEN—POSITIONS WANTED

Please see the inside back cover of the June 1958 BULLETIN for previous discussion of this column. We invite the attention of prospective employers to the following. Write, referring to Box number, to the Entomological Society of America, 1530 P Street, N.W., Washington 5, D. C.

Members seeking positions and who plan to attend the annual meeting in Salt Lake City should prepare, on a 5 x 8 card, a brief life history, qualifications, and similar pertinent date. Leave the card at the registration desk for examination by prospective employers.

Taxonomist, Hymenoptera, teacher. U. S. citizen, 31, Ph.D. Prefers teaching with research. Box 6.

Medical entomologist, parasitologist. 33, Ph.D. Teaching, research experience. Desires research-teaching or research. Box 7.

Entomologist, medical and morphological. U. S. citizen, 47, Ph.D. Broad fundamental interests and training; teaching and/or research. Box 8.

ROGER FRIEND RETIRES

Roger B. Friend, a thirty-six year member and a Fellow in the former Entomological Society of America, formerly chief entomologist and vice-director of the Connecticut Agricultural Experiment Station, recently retired after 34 years of service. Dr. Friend has the best wishes of all members of the Society.

COURSE ON MILITARY ENTOMOLOGY

The first tri-service course on Military Entomology was given at the Naval Medical School, National Naval Medical Center, Bethesda, Maryland, during the period of July 13 to 26, 1958. This course, sponsored by the Armed Forces Pest Control Board, was designed to acquaint entomologists, both within and outside of the Armed Forces with the problems, techniques, goals and philosophy of military entomology. The medical and economic aspects of the science of entomology as they relate to the military organization were presented. Subjects covered included history, contributions, operational procedures, logistics, research and developmental activities, interrelationships with other agencies, and anticipated requirements in the military organization.

The course was developed through inter-service cooperation as a means of training professional personnel and exchanging technical information. It was attended by eighteen reserve and active duty officers of the Army, Navy, Air Force and Public Health Service.

CHRYSOLINA MONUMENT

A monument to the beetle that has brought the Klamath weed under control was unveiled in Rohner Park, Fortuna, California, on July 12, 1958. During ceremonies arranged by the Wool Growers' and Cattlemen's Associations and other grateful civic organizations of Humboldt County, those individuals and the State and Federal agencies that were responsible for introducing the Chrysolina beetle were honored. More than 100,000 acres of land in Humboldt County have been cleared of Klamath weed and returned to productive grazing since the beetles were first released in 1946. E.S.A. members James K. Holloway, Entomology Research Division, USDA, and Carl B. Huffaker, Department of Biological Control, University of California, who played leading roles in the introduction and release work, were invited to attend as honored guests.

INSECTS ALOFT

W. N. Sullivan of the Entomology Research Division, USDA, cooperated in the stratolab balloon flights conducted in July 1958 by the Navy at Crosby, Minnesota, by sending aloft living insects. The objective is to determine the effects of cosmic and other radiations, temperature, and other upper atmosphere effects on living organisms. The species sent aloft included house flies, fleas, honey bees, mosquitoes, eastern tent caterpillars, wax moths, and vinegar flies (*Drosophila*). Spores of the bacterial organisms that cause the milky diseases of Japanese beetle grubs were also included. The insects and other test organisms were placed both inside and outside the balloon gondola to provide exposure to differences in temperature and radiation. The test insects and spores are now being studied by cooperating USDA entomologists and insect pathologists to determine possible genetic or other effects resulting from the high altitude exposure. Howard University, Washington, D. C., is cooperating in the detailed genetic studies which will be made on *Drosophila*. These pioneering tests will be especially helpful in developing methods as a basis for more intensive studies to be conducted in connection with subsequent high altitude flights or in any further space biology investigations that may be undertaken.

RANDALL LATTA TO USOM

Randall Latta, formerly Head of Stored Products Insects Section at Beltsville, Maryland has joined the U. S. Operations Mission, International Cooperative Administration, in the British West Indies. He was given a send-off by friends and coworkers at Beltsville. He is, we hear, becoming a calypso expert in Kingston town!

We wish to thank Dr. Latta for his contribution of some 12 back volumes of the ANNALS and 27 back volumes of the JOURNAL OF ECONOMIC ENTOMOLOGY to the Society. Such contributions are always welcome from loyal members and Latta has set a splendid example.

HARRY SCOTT SMITH MEMORIAL FUND

The obituary of Professor H. S. Smith, an Honorary Member of the Society, appeared in the April 1958 issue of the JOURNAL OF ECONOMIC ENTOMOLOGY. A Harry Scott Smith Memorial Fund Committee of which Harold J. Ryan, 808 N. Spring St., Los Angeles 12, California, is Chairman and C. A. Fleschner, Citrus Experiment Station, Riverside, California, is Secretary-Treasurer, has been organized. The memorial is being established in the form of a trust fund at the University of California. Its purpose is to perpetuate the memory of Professor Smith and his contributions to biological control by the establishment of a lectureship, a fellowship, a scholarship or a similar use. Interested persons may contact the committee officers.

RESULTS OF RECENT BALLOT ON SPECIAL MEASURES

Approximately 1600 members cast their votes with the results indicated herewith as tabulated by the *Special Counting Committee* of Alan Stone, P. G. Piquett, and R. W. Sherman.

Item 1. Shall membership dues in the Entomological Society of America be increased by $3.00 per year effective January 1, 1959?

CARRIED	Yes 939
	No 680

Item 2. Shall the Entomological Society of America become a member of the American Institute of Biological Sciences?

CARRIED	Yes 1286
	No 326

Item 3. Shall members in Branch areas pay $1.00 additional dues, this dollar to be refunded to the appropriate Branch Treasurer?

LOST	Yes 742
	No 808

The discrepancies in total ballots cast for each item resulted from failure to mark all ballots for each item.

With the approval by the membership of Item 1, the Society is now in a position to proceed with a number of projects urgently needed for healthy growth. These include the employment of a full time managing editor for Society publications, the initiation of the MISCELLANEOUS PUBLICATION IN ENTOMOLOGY for lengthy papers dealing with fundamental entomology, and the planning for a permanent home for the Society.

The pronounced sentiment for affiliation with the American Institute of Biological Sciences (Item 2) is especially timely. This association is certain to strengthen both organizations and should be of great benefit to the profession of entomology. It will also enable our membership to exercise a more decisive voice in national scientific affairs.

R. L. METCALF
President

NECROLOGY

CHAMBERLIN, T. R. 69. Retired U.S.D.A. economic entomologist. Forty four year member. At his home in Forest Grove, Oregon, August 31, 1958.

FERRIS, G. F. 65. Professor of entomology at Leland Stanford University and specialist in the Coccidae. Forty-four year member. Fellow in the former Entomological Society of America. In the hospital at Palo Alto, California, May 21, 1958.

FRANKLIN, H. J. 75. Retired economic entomologist and cranberry specialist University of Massachusetts. Fifty year member. Emeritus member. At Buzzard's Bay, Massachusetts, April 16, 1958.

GROVES, DONALD H. 30. Graduate student in entomology. Student member. In an accident at Berkeley, California, March 30, 1958.

HARTZELL, FREDERICK Z. 78. Retired economic entomologist and professor emeritus of entomology at Cornell University. Fifty year member. In Geneva, New York, June 13, 1958.

MCCONNELL, H. S. 64. Retired economic entomologist and teacher of entomology at Maryland University. Former Secretary-Treasurer of the American Association of Economic Entomologist. Thirty year member. In George Washington University Hospital, Washington, D. C., May 11, 1958.

MCGAHAN, HENRY B. Pest Control Operator. At his home in Sciotoville, Ohio, June 4, 1958.

QUAINTANCE, A. L. 88. Retired U.S.D.A. economic entomologist. Sixty year member; Charter member of the former Entomological Society of America; President A.A.E.E. in 1904; Last survivor of signers of incorporation of A.A.E.E. in 1913; Fellow of the former E. S. A. 1914. Emeritus member. At his home in Silver Spring, Maryland, August 7, 1958.

REID, ARTHUR L. 38. Economic entomologist. At his home in Jamaica, British West Indies, April 6, 1958.

SPESSARD, LESTER L. 68. Retired U.S.D.A. plant quarantine specialist. Twenty two year member. At his home in Falls Church, Virginia, May 9, 1958.

REPORT ON THE SECOND INTERNATIONAL CONGRESS OF PEST CONTROL OPERATORS. VIENNA, AUSTRIA, MAY 14–18, 1958

The first International Congress of Pest Control Operators was organized by the Germans and held in 1956 at Helmsted, Germany, with Dr. Wilhelm Hoos of Frankfurt am Main, Germany, as President.

The second Congress, sponsored by the Germans and Austrians, was held in Vienna May 14–18, 1958, with Dr. Franz Weiler of Vienna, President and Doctor Hoos as honorary President.

There were about 350 registered from 26 countries. The U. S. A. had a representation of 23. There were 40 talks, probably all invitational, representing the following sections: 1. General, 2. Public Health, 3. Stored Products, 4. Wood Protection, and 5. Plant Protection. These include the pest problems commonly handled by service operators in Europe.

Greetings were extended by the following from the U. S. A.: J. Wilfred Gunn for the National Pest Control Association; Eric Livingston for the California Pest Control Association; and J. J. Davis for the Entomological Society of America and the Overseas Committee. Two invitational papers were presented by representatives from the U. S. as follows: "Types of Insurance for Pest Control Operators in the United States" by David A. Weisburger and "The History and Status of Pest Control in America" by J. J. Davis.

At a special meeting of representatives of several countries it was agreed to form an International Union (Association) of Pest Control, and a committee was appointed to work up the details. Only Germany and Austria definitely obligated themselves to the organization. The American and other delegations are to report their recommendations to their respective associations for action. The E.S.A. delegate was advised that the proposed association included only commercial service groups and that the Entomological Society of America was not eligible for membership. The only American association eligible is the National Pest Control Association. Even so, your delegate assured the committee that the E.S.A. stood ready to cooperate and assist in every way possible. No decision was made as to the location of the next meeting, but there was a general opinion that the Congress be held every four years rather than every two.

It was the general consensus that the Congress was a marked success and should be continued. It should be noted that the meetings were held in a large room in the Schwechater Hof, with tables for the delegates, divided for German, French and English speaking representatives, with ear phones providing translations to all three languages. Praise is due the Austrians for the organization and conduct of the Congress and the excellent facilities provided.

J. J. DAVIS
E.S.A. Representative

The greetings extended by J. J. in behalf of the Society were as follows:

"On behalf of the over 4000 members of the Entomological Society of America, perhaps one of the foremost and most inclusive entomological organizations in the world, it is my privilege to extend heartiest greetings and sincere good wishes for a most successful meeting. We hope that the associations gained will cement us all to the common cause, that is, the control of destructive insects and maintenance of high crop and animal production, to the end that in this world of peace, we will be able to provide to all, adequate foods to maintain a healthy and vigorous people throughout the world.

We are grateful for the foresight of the German Pest Control Association, and many individuals, such as Wilhelm Hoos and Franz Weiler, who were responsible for the inauguration of the First International Pest Control Congress in Helmstedt, Germany in 1956. The present is the Second Congress, which we hope will be assurance of continued Congresses.

Furthermore, we in America offer our sincere cooperation with all entomologists of the world and express appreciation and thanks to the officers of this Congress and to the Austrian government who have expended so much of their time and energy in making this Second Congress so successful.

Also, may I extend similar greetings from the Overseas' Committee, Walter O. Blank, Maurice Oser and myself, and express acknowledgment and thanks to the officers of this Congress for their many aids and courtesies."

BOOK REVIEWS

A Laboratory Manual for Insect Morphology, by E. H. Strickland, B. Hocking, and G. E. Ball. N. Y. Scholar's Library. 81 pages, 3 figs. 1958.

This laboratory guide has grown out of instructions prepared by the authors for a semester course in insect morphology at the University of Alberta. It contains a minimum of illustrations, the feeling being that students can most profitably learn from examination and dissection of the specimens provided. It is suggested a minimum of lecture information be presented, the theory being students should learn by answering each other's questions and those of the instructor. Selected references which provide pertinent background information are frequently referred to.

Introductory remarks list materials necessary for good dissection, preparation of specimens, and illustrations. Dissection of fresh material in Ringer's (a formula is given) is advocated, and this is worthwhile advice as anyone with experience in examining internal structures well knows. The admonition to . . . "draw what you actually see", needs clarification. It is often necessary to interpret relationships of structures, and reassemble them for illustrative purposes.

A section covers the origin of insects. Representatives of Annelida, Onycophora, and Arthropoda are listed for examination. Included with these studies are discussions on segmentation, sclerites, and appendages. The homologies between insect and crustacean appendages are listed.

External morphology is treated by body regions, the cranium and its appendages first receiving attention. Following the basic plan, a number of modifications are studied. Eyes and antennae are examined comparatively. Chewing mouthparts initially are studied for modifications. More extreme modifications are later examined in the cicada and a tabanid fly. A suggestion that each homologous part be outlined in a particular color should be especially helpful to the student learning the derivation of various mouthparts.

Further external body regions are examined. These include the thorax proper, and legs and wings. The abdomen is divided into visceral segments and appendages, genital, and post-genital segments.

Internal morphology is discussed by systems. The alimentary system is studied in cockroach and cicada, the excretory system in three representative forms. The roach is used to study vascular system and fat body. Arrangement in a noctuid larve serves to illustrate the tracheal plan, and a few external respiratory modifications are listed. Spiracular function and air sacs are touched on. The tympanal organ of an acridid grasshopper illustrates sense organs, and the main nervous system is compared in a caterpillar, grasshopper, and bumble bee. The relationships of segmental and wing muscles are studied.

Reproductive system and male genitalia receive considerable attention. The female system is examined in a hippoboscid and grasshopper, that of the male in the roach and grasshopper. A comparative study of male genitalia is undertaken in the silverfish, earwigs, cockroach, cricket, caddisflies and a carabid beetle.

It is difficult at best to adequately cover the subject of insect morphology in a single semester, accordingly the aims of the course must be taken into consideration. The subject serves as an entity in itself and as background for areas such as taxonomy, phylogeny and physiology. The reviewer feels that more coverage would be desirable in order to meet the needs of all areas. For example, to serve taxonomy there could be included a study of female genitalia, a subject receiving increased attention. Further examples in internal morphology would be desirable as a background for phylogeny and physiology. Such points of interest as the diverticula in the aorta of adult Lepidoptera are a point in case. And why not learn about specialized chambers of the digestive tract such as are found in scarabaeid larvae, or a comparison of the vastly different gut found in many larval and adult insects of the same species? Is it sufficient to limit the study of tracheal plan to noctuid larvae when the respiratory system is more extensive in most adult insects? And shouldn't blood gills and plastron be included in external modifications for respiration?

The reviewer also does not entirely agree that sectioned preparations should be limited to courses in histology. Slides on embryology (and a brief generalized discussion of the subject) seem useful as an introduction to internal morphology. Sections of the gut clarify the muscle relationships of that structure. The four muscle types listed by Wigglesworth seem basic to a study of the musculature, and can quickly be demonstrated on slides. The same preparations show how muscles attach to the integument. What better way to really understand the structural and functional relations of sense organs, than to examine sections of sensilla, Johnston's organ, and compound eye? Examination of the internal structure of the insect brain adds much to the comprehension of its regions, and the same holds true for the reproductive system.

In the interest of permitting sufficient coverage in a minimum time, the reviewer feels more illustrations could have been included. Perhaps the student would rely on the drawings rather than his own dissection, but if they are diagrammatic he is forced to make his own more accurate observations.

This laboratory manual is definitely a much needed contribution. Points of criticism are aimed toward the inclusion of more material, not at the accuracy or essential nature of what is present. Additional coverage would allow the student to concentrate further on areas of his own interest.

The authors have sought for the most part to choose representative specimens that can be readily obtained. As a result Apterygotes receive limited attention, since most of them are hard to obtain or dissect. At any rate, they receive little attention from most students.

This guide will be a valuable aid to anyone interested in the subject of morphology, and can profitably be used in courses offered on the subject.

Robert F. Harwood

Chemical Aspects of Ecology in Relation to Agriculture. By Hubert Martin. Publication 1015, Science Service, Canada Department of Agriculture. 96 pages July 1957. Available from the Queens Printer, Ottawa, Canada. Price $3.00.

The book reviews what is known concerning the significance and nature of chemical factors involved in antibiosis and symbiosis. The author has searched the literature, screened the information and organized it into chapters based on the main components of a crop environment—higher plants, insects, fungi, bacteria in their intra- and inter-group relationship. Each chapter is followed by a list of the references cited. A terminal subject index provides ready access to most topics and to the plant and animal organisms mentioned in the text. The 525 names contained in the author's index is a measure of the quantity of literature surveyed.

The author refers to the subject matter of his book as "ecological chemistry." In other words, the chemistry of the biological processes by means of which one organism affects another. Ecologists have generally been content to record results of such interactions between organisms without being too concerned with the mechanics of the process. However, it is the author's contention that knowledge of the biologically active chemicals present in a crop environment is prerequisite to a study of the effects of chemicals introduced into the environment in the form of insecticides, fungicides, or herbicides.

It appears that much more is known of the chemistry of the processes by which one plant affects another, than there is of the processes by which animals affect plants or other animals. This is no occasion for surprise since in plants antibiosis and symbiosis are commonly the result

of metabolic products that are either excreted into the environment where they directly affect the physiology of neighboring plants, or are retained in the tissues where they have a repellant or toxic effect on animals that might feed on such plants. Such processes are more complex among animals where behavior plays a predominant role in intra- and inter-species relationships and chemistry is relegated to a more distant but not less important role in the physiology of behavior.

The chapter on "Higher Plants vs. Insects" is principally concerned with the chemical defenses of plants against insects and the chemotropic responses which enable insects to recognize their host plants. There is also a short summary of information regarding such hormonal phenomena as photoperiodism, diapause, and metamorphism. The author believes we are on the threshold of isolating and identifying the active chemicals which induce and direct the various steps and changes in insect development and life cycles.

Among ecologists some purists may object to the term symbiosis as it is used here. Literally, symbiosis means "living together" and the relationship whereby organisms mutually benefit when they live together is referred to by many authors as mutualism. But this is a small point, for the author's meaning is clear. He has packed an amazing amount of information into 96 pages and made it quite clear that little more than the surface of "ecological chemistry" has been scratched. It is an unusual paragraph that does not present a challenge for further research.

REECE I. SAILER

THE MEDICAL AND VETERINARY IMPORTANCE OF COCKROACHES. By Louis M. Roth and Edwin R. Willis. Smithsonian Miscellaneous Collections, vol. 134, no. 10, pp. 1–147, pls. 1–7, Dec. 19, 1957. Price—$1.25.

For about seven years the authors have been publishing the results of their research on the biology of cockroaches, conducted at the Quartermaster Research and Engineering Center, Natick, Mass. (and earlier in Philadelphia). Their papers are outstanding examples of how the knowledge of a single group of insects may be advanced by concentrated effort and the advantages of excellent facilities and strong organizational support. This paper is not based primarily on original experiments, though the authors almost surely would have been handicapped in reviewing the results of other writers if they themselves had not possessed a thorough background in cockroach biology. In their own words, the paper is "a documented summary of the tangled relations between cockroaches and the organisms that cause disease in man and other animals. It directs attention to the impressive body of literature that incriminates cockroaches as actual or potential vectors of disease agents".

The main effect of this paper is to focus attention on the importance of cockroaches in transmitting organisms which cause disease; until now the supposition that they are dirty insects but not disease carriers has been far too general. On the other hand, it should not be assumed that the majority of cockroaches are spreading disease. The potential undoubtedly occurs, particularly when cockroaches travel back and forth between sewers or privies and open food, but the evidence for actual transmission still is largely circumstantial, as is true in most instances for the house fly. It can fairly be said that the circumstantial evidence, here compiled piece by piece and very well organized, first as a brief summary for each class of disease-causing organisms, and then as a corresponding appendix documented in detail, indicates strongly that transmission occurs under favorable conditions. In the case of diseases caused by the various helminths for which cockroaches serve as intermediate hosts there is no doubt that these insects play a critical role. The pathogenic bacteria, of which about 40 species have been isolated from naturally contaminated cockroaches, are the most important group of organisms carried. Especially does it appear that enteric diseases have been spread by cockroaches, and that under some conditions cockroaches are more important as vectors than the house fly. Among the behavior contrasts between the two insects are the greater activity of flies, their usual more wide dispersal, their more likely avoidance of dark places, and their greater conspicuousness through daytime activity.

Literature coverage in this paper, including some important sources in Russian, appears very complete, and the amount involved is suggested by the 98 pages comprising appendices, bibliography, and index. The essential synthesis of the authors, as compressed in the first 47 pages, is quite readable, in fact is quite awakening, and it is recommended to all entomologists and public health workers. This paper should mark the beginning of a new period in our outlook toward cockroaches, characterized by neither placid indifference nor hasty assumptions of heavy guilt, but by intelligent awareness of real potential and occasional involvement in the serious spread of disease.

ASHLEY B. GURNEY

NEW PUBLICATIONS

1958 AMERICAN POTATO YEARBOOK. The current volume contains 80 pages of information to the potato grower, shipper, jobber, agricultural teacher, research specialist and all others connected with potatoes in any way. The YEARBOOK gives information on how and where to secure helpful brochures and leaflets covering all phases of the potato industry. The new volume contains a wealth of statistical information. Copies may be secured from the AMERICAN POTATO YEARBOOK, 8 Elm Street, Westfield, New Jersey. An individual copy sells for $2.00. A complete volume, 1950–1958, is available at $10.00.

1958 AMERICAN TOMATO YEARBOOK. John W. Carncross, Editor; C. Stedman Macfarland, Jr., Publisher, 8 Elm Street, Westfield, N. J., 40 pp., price $2.00. The book is profusely illustrated with up-to-date charts, graphs and pictures, giving a complete resume of the tomato industry. A complete volume, 1951–1958, is available at $10.00.

GENERAL CATALOGUE OF THE HOMOPTERA, Fascicle IV—Superfamily Fulgoroidea, by Z. P. Metcalf. This catalogue was virtually complete at the time of the death of Dr. Metcalf on January 5, 1956. It is also planned to publish under his authorship the catalogues for the Superfamilies Cicadelloidea, Cercopoidea, Cicadoidae, the fossil Homoptera, and a supplement to Funkhouser's Catalogue of the Membracidae. These catalogues will be complete through 1955. Orders for single numbers or subscriptions to the whole should be sent to Clyde F. Smith, Box 5215, North Carolina State College, Raleigh, North Carolina.

THE TARANTULA, by William J. Baerg. ix + 88 pages, 19 illus. Publication date August 21, 1958. University of Kansas Press, Lawrence, Kansas. Price $3.00. (See review in an early issue of the ANNALS OF THE ENTOMOLOGICAL SOCIETY OF AMERICA).

NEW SERIAL AT STUTTGART

Attention is called to the publication of a new series on natural history by the Staatliches Museum für Naturkunde in Stuttgart, Germany, under the title "Stuttgarter Beiträge zur Naturkunde". Each contribution will have a separate number and pagination. All branches of natural history will be included, but the fact that the first five papers are all entomological (three on Orthoptera, two on Diptera) suggests that entomology will have a prominent place in the series. The first three numbers are dated Dec. 15, 1957, the next two Feb. 15, 1958. The editor is Dr. K. W. Harde, curator of the Entomological Department of the Museum. Exchanges are invited.

CURTIS W. SABROSKY